Columbia Regional Airport

Terminal Area Master Plan

Technical Report

October 2017

FINAL

Prepared for:

City of Columbia, Missouri

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1 INTRODUCTION

The City of Columbia completed a Master Plan Update (MPU) for Columbia Regional Airport (COU or the Airport) in September 2009. The passenger enplanement data used to base the passenger forecast represented the lowest in the Airport's history, and was used as the basis of the recommended airport terminal improvements. The primary focus of the Master Plan Update was to evaluate and consider alternatives to improve the layout and pavement conditions of the airfield. Only assessments of minor enhancements to the existing terminal building were conducted as part of the MPU.

Since the completion of the MPU, significant changes have occurred in passenger enplanements. Since 2007, the year upon which the MPU passenger forecast is based, enplanements have increased from 9,000 to 64,300 in 2015. While the MPU did include an "enhanced" air service scenario (in which greater air service would be offered at the Airport), that forecast projected reaching 62,000 enplaned passengers by 2027.

With the fading of the economic recession, enplanement activity has rebounded and industry expectations are that aviation growth will continue. The dramatic increase in passenger growth at COU has led to a need to study the near-term and long-term terminal development needs of the Airport and provide an implementation plan for use by the City of Columbia. This Terminal Area Master Plan (TAMP), prepared by WSP USA (formerly known as WSP/Parsons Brinckerhoff or Parsons Brinckerhoff, interchangeably referred to throughout), will primarily focus on the terminal building, vehicular parking, and terminal apron areas at the Airport.

This document describes the analyses and assessments conducted during the Terminal Area Master Plan process and provides the results of those efforts. The TAMP is intended to span approximately a 20-year period; however, certain aspects of the recommended plan will take into consideration expansion beyond the final planning horizon. The intent is to maintain a flexible framework, to allow for contingencies which are increasingly a part of airport development, and to not in any way propose a rigid program which would inhibit the City's ability to respond to circumstances that cannot be reasonably predicted at this time.

Specific elements included as part of the TAMP are:

- Inventory of existing conditions
- Activity forecasts
- Facility requirements
- Alternatives development
- Financial overview
- Implementation plan
- Environmental overview and
- Airport layout plan drawing set preparation.

The remainder of this chapter discusses previous Master Plan and terminal planning efforts, and a summary of the public involvement program.

1.1 Previous Studies

1.1.1 2009 Master Plan

The current MPU for Columbia Regional Airport was adopted by the City of Columbia in September 2009. The recommended Capital Improvement Program included approximately $65 million of improvements for the twenty year planning period (2010-2029). Short-term improvements (2010-2016) accounted for $48.6 million, and long-term improvements (2017-2029) accounted for $16.4 million[1].

Short-term development included projects focused on airfield projects including:

- Rehabilitation and reconstruction of Runway 13-31
- Repairs to Runway 2-20
- Rehabilitation of Taxiway A
- Extension of Runway 13-31 to the east
- Relocation of Runway 13 end point
- Extension of Runway 2-20 to the north
- Land acquisition and public roadway realignments

Long-term development projects focused on hangar and terminal area development including the following:

- Air cargo apron expansion
- Terminal parking lot expansion
- Hangar area expansion (north and south)
- Construction of airfield perimeter road system
- Relocation/construction of new Airport Rescue & Fire Fighting (ARFF) building

1.1.2 Airside, Landside, Surface Transportation Developments Environmental Assessment

An Environmental Assessment (EA) concluded in July 2013 which examined the environmental impacts of multiple airfield and surface transportation projects associated with the short-term improvements identified in the 2009 MPU. The proposed action included the following projects[2]:

- Extension of Runway 2-20 and Taxiway A to 7,400 feet in length
- Extension of Runway 13-31 and Taxiway B to 5,500 feet in length
- Widening of Runway 13-31 to 100 feet
- Rehabilitation/Reconstruction of Runways 2-20 and 13-31, Taxiways A & B, and South Apron
- Land acquisition totaling 52 acres
- Realignment of Route H & South Rangeline Road
- Construction of Taxiway A5
- Widening of Taxiway A4

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[1] Columbia Regional Airport Master Plan Update, RS&H, September 2009.
[2] Columbia Regional Airport Final Environmental Assessment, RS&H, July 2013.

- Apron expansion between Taxiways A2 & A3
- Obstruction removal
- NAVAID relocation and replacements
- Auto parking lot expansion
- Amend instrument approach procedures
- Infield drainage improvements

The result of the EA was a Finding of No Significant Impact (FONSI).

Further discussion of the improvements associated with this EA and their impacts on the Terminal Area Master Plan will be included in Chapter 4 – Facility Requirements and Chapter 5 – Alternatives Analysis.

1.1.3 2012 Passenger Demand Analysis

A passenger demand analysis was completed in 2012 to develop information on the travel patterns of local airline passengers who reside in the COU geographic area. The analysis found that as of 2011, COU's true market retention was 11 percent. Information from this study will be further outlined and referenced in Chapter 3 – Aviation Activity Forecast.

1.1.4 Terminal Conceptual Design Report

A preliminary analysis on options to expand and/or renovate the existing passenger terminal facility was conducted in 2011[3]. The conceptual design alternatives focused on expanding the terminal building to either the north or the south, while renovating the existing facility. Elements from this study will be discussed further in Chapter 5 – Alternatives Analysis.

1.2 Public Involvement Program

Over the course of the Terminal Area Master Plan, the Consultant Team, working with City of Columbia staff, conducted several informational meetings and workshops aimed at disseminating information to various groups, both on and off airport property. To facilitate a heightened awareness amongst these groups and to solicit valuable input to the study process, a Technical Advisory Committee (TAC) and a Citizens Advisory Committee (CAC) were formed which represented key stakeholders and interested entities. The TAC and CAC participated throughout the study process and were involved at key milestones. The TAC and CAC were comprised of representatives from the following organizations:

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[3] Terminal Conceptual Design Report, Columbia Regional Airport, RS&H, February 2011

- City of Columbia
- Federal Aviation Administration
- Missouri Department of Transportation
- Airport Tenants
  - American Airlines
  - Central Missouri Aviation
  - Hertz
  - Avis
- Air Traffic Control Tower
- Transportation Security Administration
- Regional Economic Development Inc.
- City of Ashland
- Columbia Chamber of Commerce

The TAC and CAC met twice during the study process:

1. Project Background, Existing Conditions Inventory, and Aviation Activity Forecasts – September 2, 2015
2. Facility Requirements / Alternatives Development – February 3, 2016

Public involvement through an open house format presentation to provide information, and to seek critical input to ensure the study's success and acceptance. The Interested Parties workshop took place on March 22, 2016 and covered topics through the Alternatives Development phase of the study.

Two Airport Advisory Board briefings were held during the TAMP study on September 2, 2015, and February 3, 2016. Presentations on the status of the study process were also made to the Columbia City Council on February 15, 2016 and May 2, 2016.

Details of the TAC and CAC meetings, the Interested Parties workshop, the Airport Advisory Board briefings, and the City Council presentations can be found in **Appendix A**.

2 INVENTORY OF EXISTING CONDITIONS

The purpose of this chapter is to provide an inventory of facilities and conditions that currently exist within the terminal area of Columbia Regional Airport. This information will provide a basis for the evaluation of the existing facilities in order to develop recommendations for anticipated future terminal improvement needs.

Since one of the potential alternatives for terminal development will involve a Greenfield terminal site to serve as a replacement to the existing terminal, an understanding of the existing and planned airfield facilities at the Airport is needed to fully understand the context of the Airport. Consequently, a brief summary of the Airport's existing and planned airfield, general aviation, and support facilities is presented in the chapter in addition to existing terminal facilities.

The following topics are discussed in the remainder of this chapter:

- Airport Setting
- Airport Overview
- Airfield Facilities
- Terminal Facilities
- Ground Transportation Facilities
- General Aviation and Support Facilities

2.1 Airport Setting

Columbia Regional Airport is a public-use airport located in Boone County, Missouri, approximately 10 miles southeast of the City of Columbia, 20 miles northeast of Jefferson City, and 4 miles northeast of Ashland, as shown in **Exhibit 2.1**. The Airport is 1.5 miles east of US Highway 63. Primary access to the Airport from US Highway 63 is through its exit at Highway H.

COU is a Non-Hub Primary Commercial Service Airport as classified in the *National Plan of Integrated Airport Systems* (NPIAS) by the Federal Aviation Administration (FAA). The *Missouri State Airport System Plan* classifies the Airport as a Commercial Service facility.

The Airport is primarily an origin and destination (O&D) airport with 100 percent of its passengers originating from the Airport. As of September 2015, COU is served by one passenger airline providing four daily nonstop departures to two destinations.

In terms of economic impact, it is estimated the Airport generates over $87 million in economic impact to the community annually, by way of sales, wage earnings and employment output. The Airport is directly responsible for nearly 750 full-time jobs, generating an annual payroll of $27 million per year[4].

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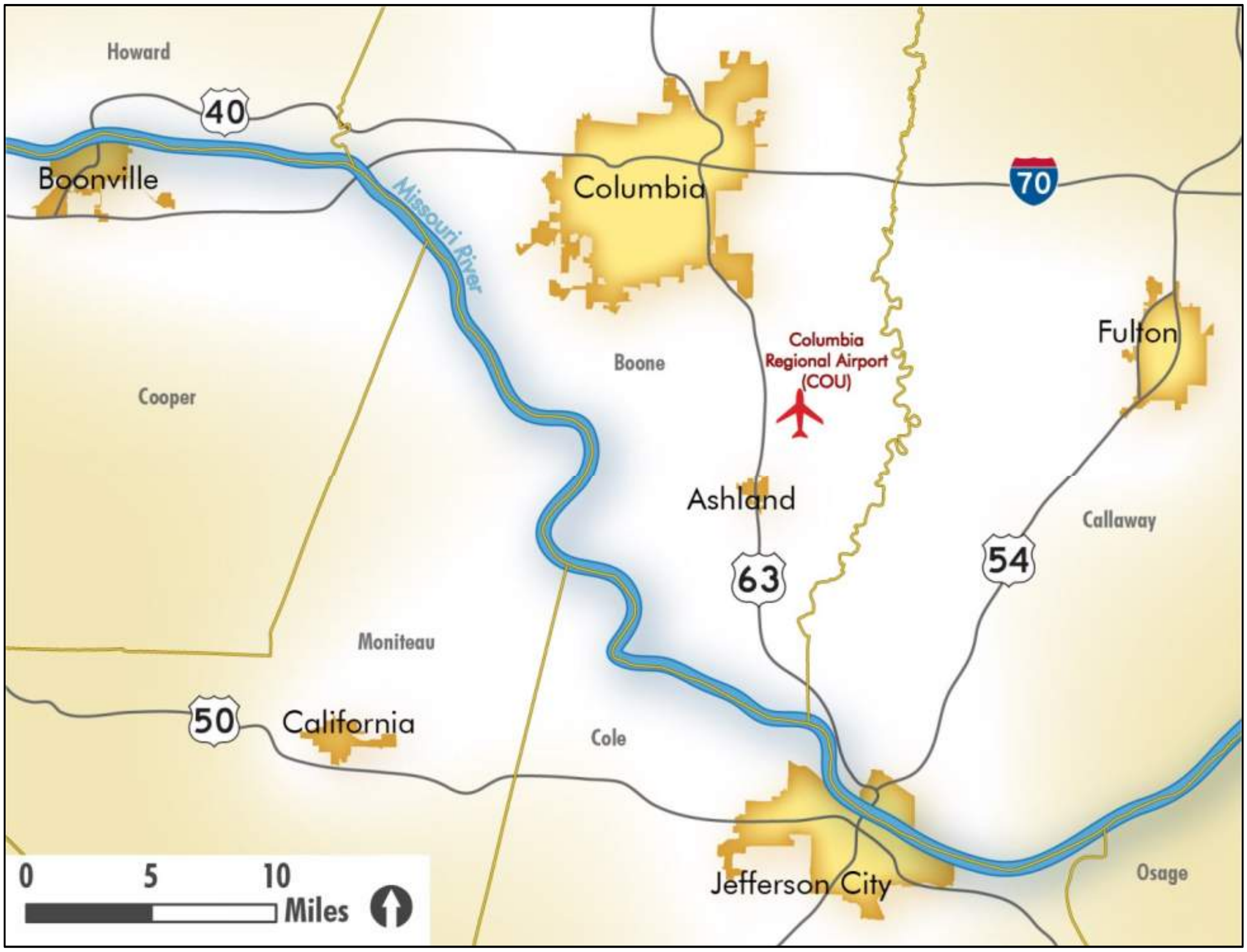
[4] 2012 Missouri Statewide Airports Economic Impact Study, Missouri Department of Transportation, prepared by Landrum & Brown, 2013.

Exhibit 2.1 Airport Vicinity Map



2.2 Airport Overview

Columbia Regional Airport occupies approximately 1,600 acres, of which approximately 560 acres are for aeronautical purposes and 92 are avigation easements (air rights). The Airport is generally bounded by Highway H to the north, Rangeline Road to the east, agricultural properties to the west, and East New Salem Lane to the south. **Exhibit 2.2** presents the overall Airport site and its primary components.

The airfield consists of two intersecting runways serviced by parallel taxiways, apron areas, taxiway connectors and an Air Traffic Control Tower (ATCT). There are six gated auto access points providing secured and monitored vehicle access onto the apron (airport operations area).The apron provides access to one fixed base operator (FBO), multiple corporate hangars and box hangars.

The passenger terminal building, situated on the west side of the Airport, is located on Airport Drive, accessible from either Highway H or East Angel Lane. The terminal building is a two-level building, totaling 18,775 square feet.

The three surface parking lots accessible to commercial service passengers are located in front of the passenger terminal building along Airport Drive. A rental car lot is located adjacent to the terminal building to the south. More detailed information on surface parking and rental car facilities is included in Sections 2.5.1 and 2.5.3, respectively.

Aviation support facilities include ARFF, airport maintenance, cargo, airport fuels, an FAA ATCT, utilities and fencing.

2.3 Airfield Facilities

Exhibit 2.3 depicts the airfield facilities at COU. The Airport is currently recognized as an Airport Reference Code (ARC) C-III facility based on FAA criteria[5].

2.3.1 Runways

The airfield currently consists of two runways with intersecting ends (Runway 20 and Runway 31). Runway 2-20 is the primary runway, running north-south. Runway 13-31 is a crosswind runway, running east-west. Both runways are lighted, have a straight-in instrument approach procedure and are served by a full-length parallel taxiway system. Basic runway data are summarized in **Table 2.1**.

2.3.2 Taxiways

The taxiway system provides access between runway and terminal area environment, thus increasing operational safety and efficiency by reducing interference between departing and arriving aircraft. COU is served by two primary taxiways and their associated connector taxiways:

- Taxiway A is a 75-foot wide full length parallel taxiway west of Runway 2-20. Taxiways A1 through A5, and Taxiway D serve as connectors between Runway 2-20 and the Airport's ramp areas
- Taxiway B is a 35-foot wide full length parallel taxiway south of Runway 13-31. Taxiways B1 and B2 serve as connectors between Runway 13-31 and the Airport's ramp areas.

2.3.3 Navigational Aids and Approach Minimums

Various navigational aids (shown in Table 2.1) are located for each of the Airport's runways enabling aircraft to operate under most weather conditions. An FAA ATCT is also located on the east side of Runway 2-20 opposite the passenger terminal building.

Runway 2-20 is a precision instrument runway, while Runway 13-31 is non-precision. Runway end 2 is equipped with a Category I Instrument Landing System (ILS), allowing aircraft approaches to a decision height of 200 feet above ground level, and visibility minimums of ½ mile. Runway end 20 provides non-precision approaches with visibility minimums down to ¾ mile. Runway ends 13 and 31 provide non-precision approaches with visibility minimums of 1 mile[6].

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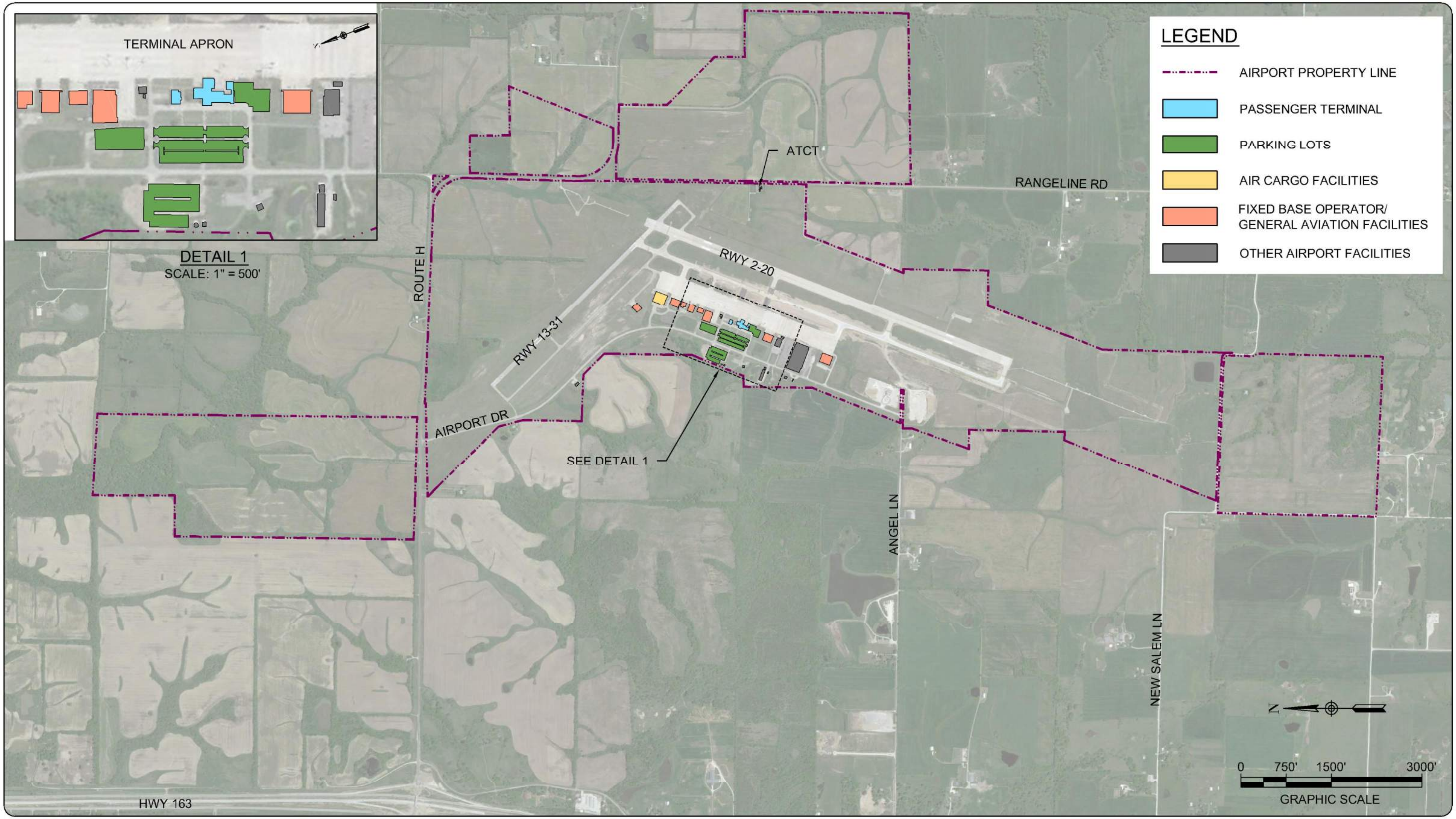
[5] Airport Layout Plan for Columbia Regional Airport, July 2011.
[6] Airport Layout Plan for Columbia Regional Airport, July 2011.

Exhibit 2.2 Airport Site Overview



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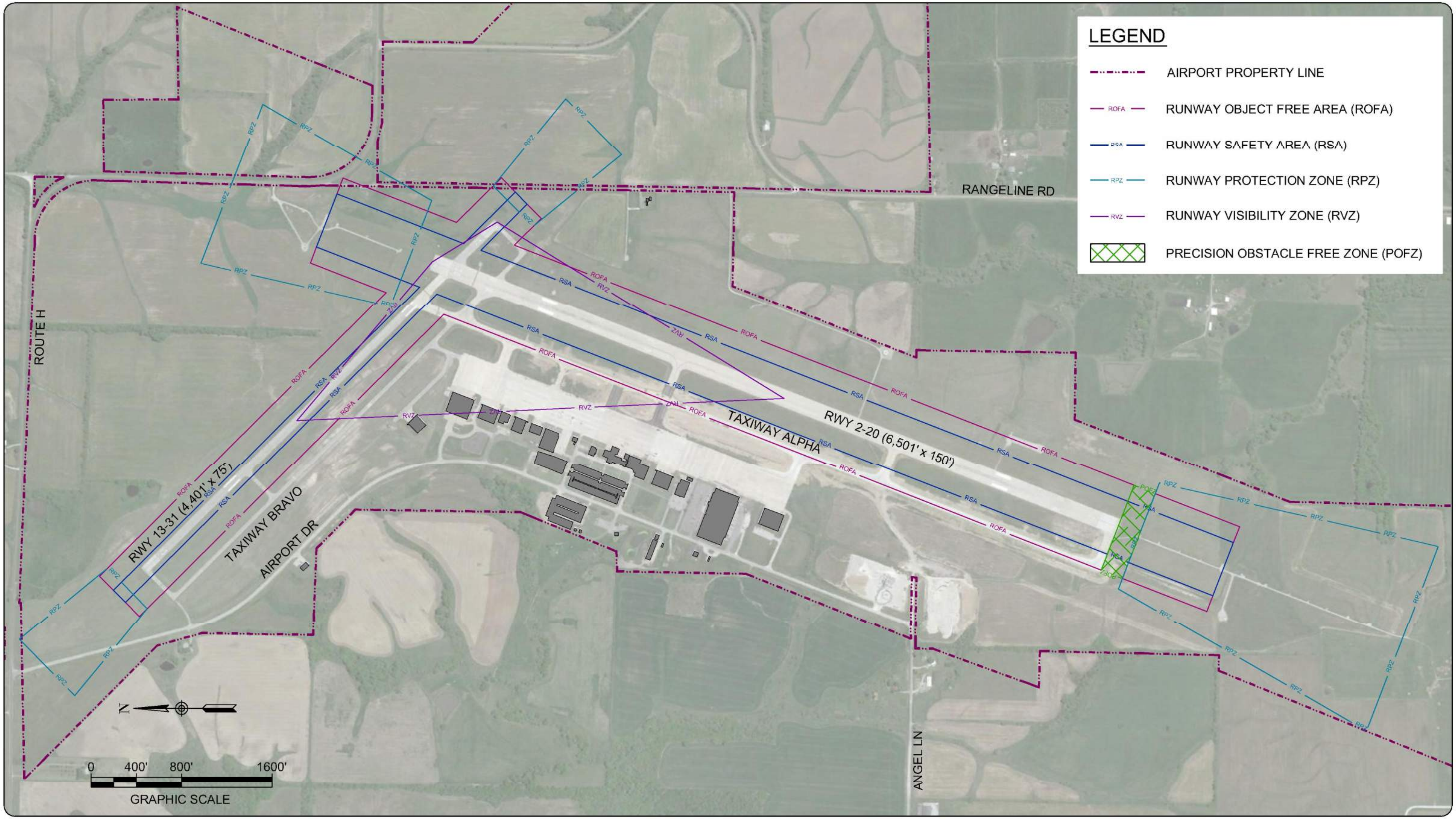
COLUMBIA
Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

Airport Site Overview

EXHIBIT
2.2

Exhibit 2.3 Existing Airfield Facilities



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COLUMBIA Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

Existing Airport Facilities

EXHIBIT
2.3

Table 2.1 Existing Runway Data

Item	**Runway 2-20**		**Runway 13-31**	
Runway Design Code	C-III		B-II	
Runway Length (ft)	6,501		4,401(1)	
Runway Width (ft)	150		75(1)	
Runway Marking	Precision		Non-Precision	
Runway Lighting	HIRL		MIRL	
Runway End	*2*	*20*	*13*	*31*
Instrument Approach Procedures	ILS CAT I LOC/DME RNAV (GPS)	RNAV (GPS) LOC/DME BC VOR/DME VOR	RNAV (GPS) VOR	RNAV (GPS)
Approach Aids	MALSR, LOC, GS	VASI, ODALS, REIL	VASI, REIL	VASI, REIL

Notes:

(1) **Runway 13-31 in the process of being expanded to 5,500' x 100'**

Sources: Airport Layout Plan for Columbia Regional Airport, July 2011; FAA Instrument Approach Procedures, August/September 2015.

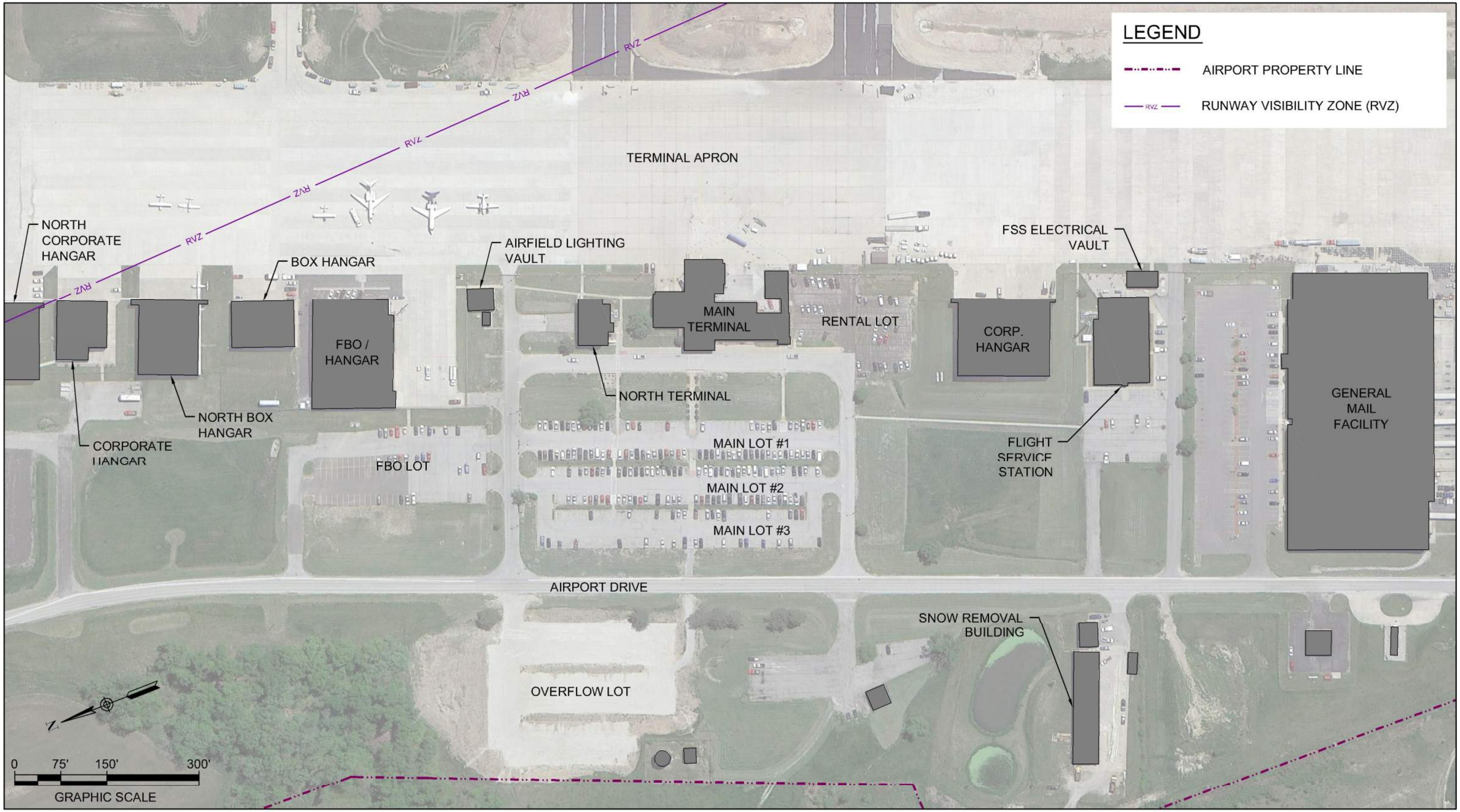
2.4 Terminal Facilities

The passenger terminal building and associated facilities are located on the west side of the Airport off of Airport Drive as shown in **Exhibit 2.4**. The main passenger terminal building and adjacent north terminal building were constructed in 1968. Construction consists of a mixture of load-bearing masonry walls and steel frame walls with masonry face brick veneer. Concrete and metal deck composite floor slabs and membrane roofing systems are supported on steel beam / steel joist framing systems. Major additions to the main terminal building occurred in 1983 adding ticketing and holdroom space on the south side of the structure. The 1983 addition is of a consistent construction type as the original facility. Expansions through 2012 converted the baggage claim area to a second passenger holdroom, and relocated baggage claim operations to its current location on the south end of the terminal building. The 2012 construction work consists of wood framed pre-fabricated buildings.

The passenger terminal building's exterior façade and layout are indicative of the style that was popular during its construction in the late 1960s. The interior layout of the building is structured to handle passenger flow under air service conditions found prior to airline deregulation in the late 1970s. The creation of the Transportation Security Administration (TSA) in 2001 and the subsequent changes FAA and TSA security directives has significantly altered space needs within passenger terminal buildings.

The following sub-sections provide an inventory of the existing spaces within the passenger terminal building, operational and building deficiencies related to the interior layout, and condition assessments of the structural, mechanical, and electrical systems.

Exhibit 2.4 Terminal Area Overview



COLUMBIA Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

Terminal Area Overview

EXHIBIT
2.4

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2.4.1 Terminal Space Inventory

Floor plans of the passenger terminal building are shown on **Exhibit 2.5**. The passenger terminal building is a two-level building totaling 18,775 square feet that supports two aircraft ramp loaded parking positions. The main level contains the passenger processing areas including ticket counters, baggage sorting and baggage claim, rental car counters and offices, the security screening checkpoint, passenger holdrooms, and airport and airline operational spaces. Included in the airport operational spaces of the main level are the Airport Public Safety Office, and the ARFF facilities.

The second level is divided into two areas, with separate access points into each area. The northern portion of the second level, above the Airport Public Safety Office, houses the Airport Manager's office and associated airport administration areas. The main portion of the second level, located above the airline offices, contains restaurant and concessions support space, and building mechanical rooms.

A breakdown of the existing space allocation within the main terminal building is shown in **Table 2.2**.

Table 2.2 Existing Main Terminal Space Allocation Summary (in square feet)

Terminal Function	Level 1	Level 2	Total
Airline Ticket Office/Support	1,747	-	1,747
Airport Support	3,660	1,143	4,803
Baggage Claim	945	-	945
Concessions	473	759	1,232
Concessions Support	-	303	303
Holdrooms	2,370	-	2,370
Inbound Baggage Delivery	219	-	219
Outbound Baggage Makeup	601	-	601
Public Circulation	3,198	41	3,239
Rental Car	774	-	774
Restrooms	885	-	885
Security Screening Checkpoint	792	-	792
Ticketing	865	-	865
Total Area	**16,529**	**2,246**	**18,775**

Source: City of Columbia; Parsons Brinckerhoff analysis, 2015.

Exhibit 2.5 Main Terminal Floor Plan

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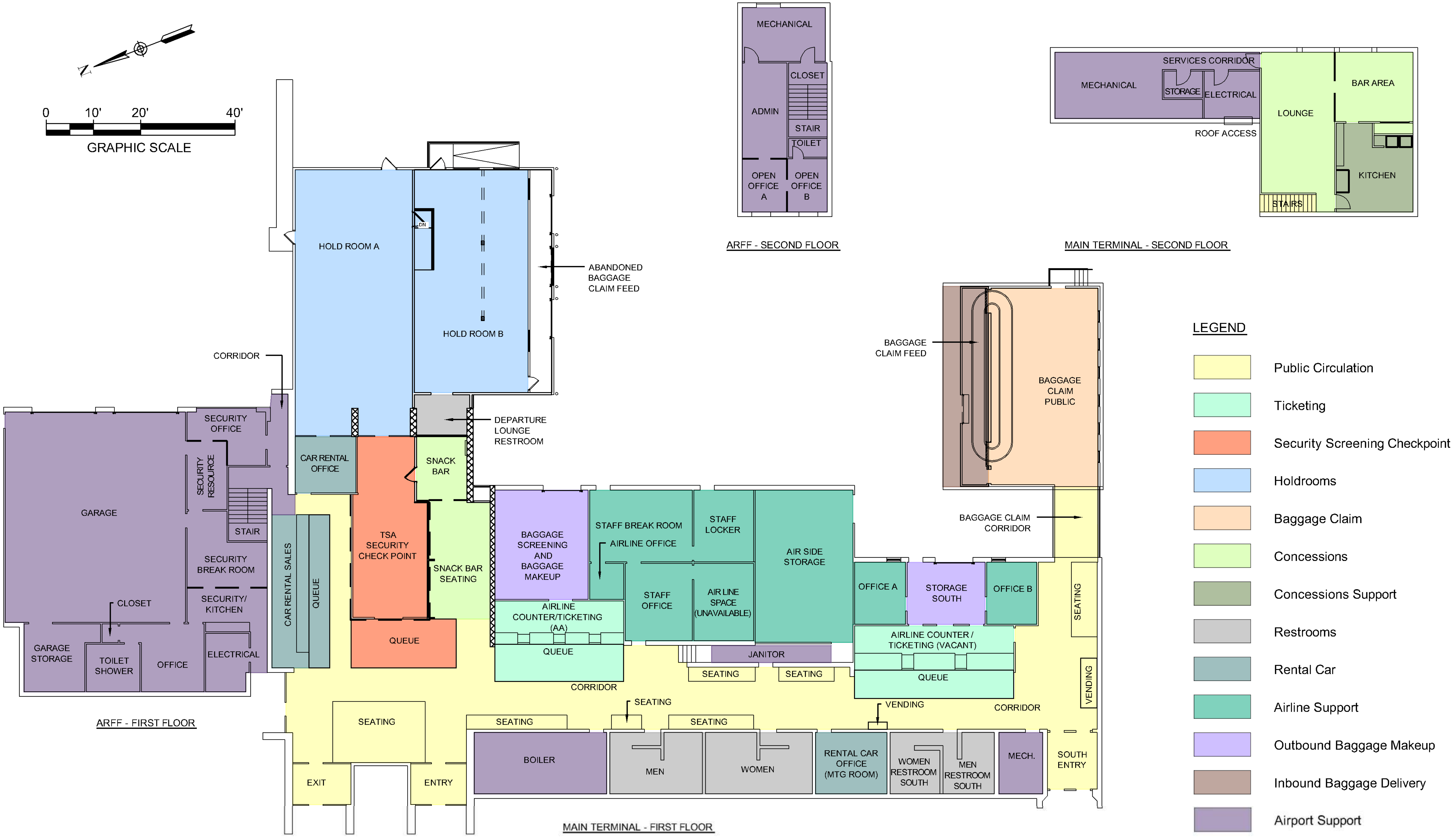


COLUMBIA
Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

Main Terminal Floor Plan

EXHIBIT
2.5

2.4.2 Terminal Building Code Analysis

Based on current code classifications, as defined by prevailing version of the International Building Code (IBC), the primary terminal building would be considered an Assembly area, Use Group A-3. Additional, secondary uses would include S-1 Storage for general back-of-house operations, potential S-2 Storage for some areas which store chemicals in varying quantities based on seasonal usage, B-Business for some office areas. The current floor area barely exceeds limitations allowed in the code for non-separated mixed use facilities and would therefore require additional fire-rated room separations as well as the need for an automated fire suppression system. If an expansion or major renovation should occur at the existing terminal building, these upgrades to active and passive fire control systems would be required. A cursory evaluation of the building envelope thermal properties shows the current facility is near the threshold for achieving minimum compliance with current energy requirements. This cursory review did not take into account a full analysis of mechanical systems or lighting consumption. Currently the terminal second level is non-accessible to mobility impaired and therefore does not comply with current accessibility standards per IBC, Chapter 11. In order to comply, an automated vertical circulation element, such as an elevator, would need to be incorporated into the existing terminal to serve the upper level should that level come back into service.

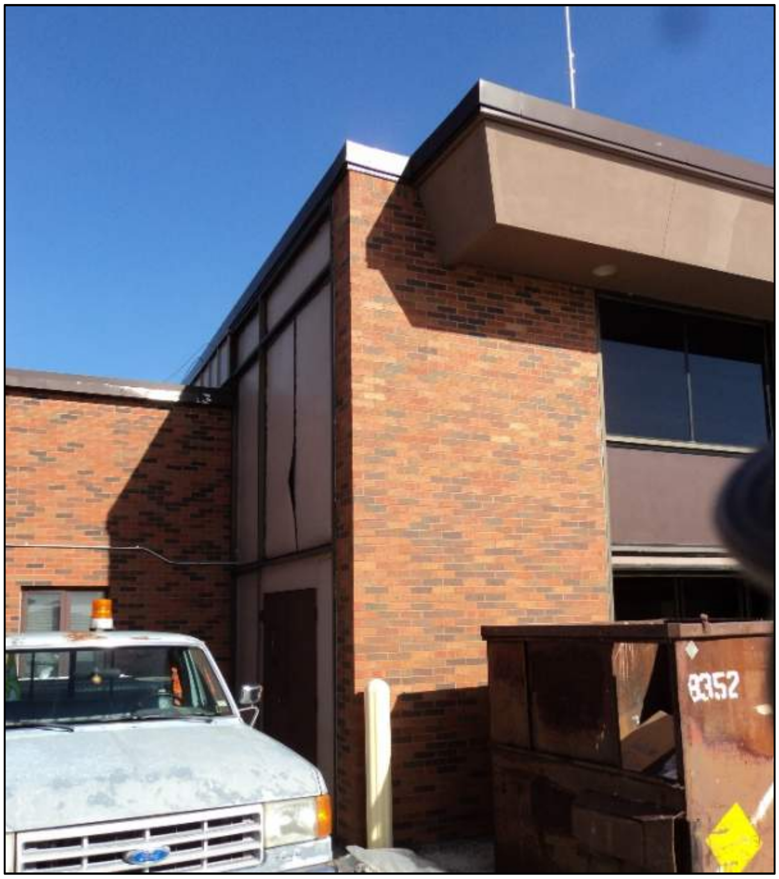
Door hardware is generally not in compliance with current ADA requirements. In addition, several door openings are too narrow to comply with accessibility requirements. Any future use of this terminal should include replacement of doors / frames and hardware to comply with current codes.

A 2011 renovation project modernized the existing public restrooms in terms of material finishes and fixtures, but these spaces still do not meet accessibility requirements; therefore a separate facility is provided for accessible toilet functions. While this would achieve minimum standards for compliance, it does not speak to an equivalent service level for all public users.

2.4.3 Terminal Exterior

In general the overall condition of the facility structure appears sound and maintained. The architectural finishes around the exterior of the facility are in varying conditions (see **Exhibit 2.6**). The face brick facades appear well maintained and with the exception of some minor settlement cracking in the mortar, the majority of the brickwork is in good condition. There are several areas at the roof level where bricks and mortar are cracking. Previous remediation appears to have saw-cut and applied sealant to the most severely affected areas. The interior surfaces of the wall in these areas were not accessible to view for potential issues or remediation.

Exhibit 2.6 Building Perimeter Conditions



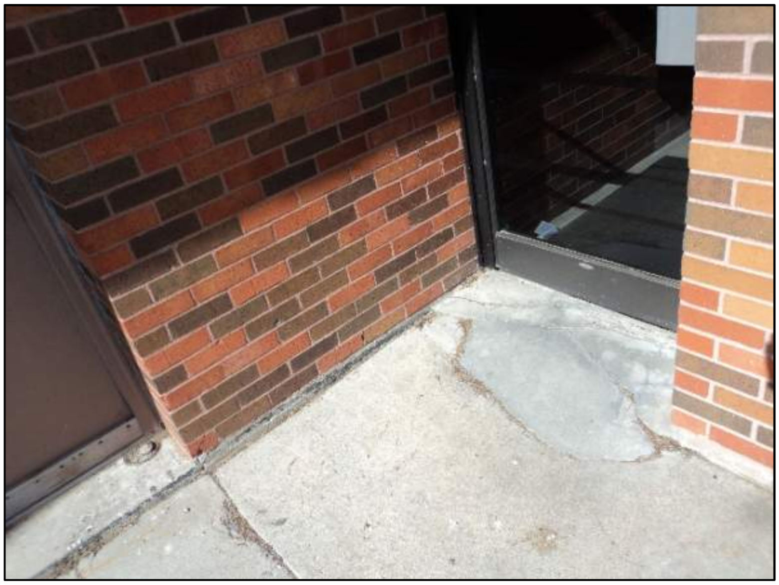
Source: Site Visit, Parsons Brinckerhoff, May 2015.

The condition of storefront systems, including glazing and solid panels is damaged and appears to be in need of replacement. In speaking with on-site staff, these areas appear to have been sources of water infiltration in the past and have also provided issues related to thermal resistance during seasonal extremes.

Cementitious soffit panels enclosing top of wall / roof connections appear to be in good condition. The terminal roof has recently been replaced according to on-site staff. The current roof is a black membrane roof and appears to be mechanically fastened underlayment with an adhered membrane. The condition of this roof appears to be sound; however on-site staff has reported ongoing issues of water leaks during heavy rains and in periods of snow-melt. General seams and joints on the roof appeared sound, so the leak issues are likely sourced at flashing, parapets or equipment enclosures.

Exposed concrete foundations appear sound, with minimal cracking noticeable. There does appear to be some settling of concrete walks and pads adjacent to the facility (see **Exhibit 2.7**). The cause of this may be related to poor drainage practices at the perimeter of the building.

Exhibit 2.7 Concrete Conditions at Doorway



Source: Site Visit, Parsons Brinckerhoff, May 2015.

2.4.4 Terminal Interior

Brick, masonry and wall tile throughout the interior spaces appear in good condition and are well-maintained. Walls consisting of painted gypsum board show considerable wear and damage consistent with this type of fragile material when used in public spaces. Ceilings in high-bay spaces appear in good condition, but with some discoloring from what are assumed to be roof leaks. Lay-in acoustical ceiling tile panels in the remainder of the facility are in poor condition with several damaged tiles from maintenance access and water damage. The grid system is discolored and is in need of replacement. The flooring in the majority of the terminal public spaces and back of house is vinyl composition tile. The flooring is in poor condition and is in need of replacement. While this type of floor is inexpensive to install, the life-cycle maintenance costs of maintaining this floor exceed other high-quality, low-maintenance alternatives such as granite tile, terrazzo or resinous flooring systems.

2.4.5 Structural Systems

The structure of the existing terminal building includes steel and concrete columns, steel roof / floor framing with I-shaped beams as primary framing and open-web steel joists as secondary framing (see **Exhibit 2.8**). Some areas appear to also utilize load bearing CMU walls in addition to the overall framing. Rib metal decking is used for second floor and roof deck composition. Slab on grade is poured concrete. The overall condition of the building structure appears to be good and maintained. The clear height of the structure does not accommodate the considerable depth of interstitial space required in contemporary transportation facilities to provide adequate building services including HVAC ducting, lighting, cable trays for extensive communications / technologies, incorporation of a piped fire suppression system, etc. In addition, the restricted clearances of the structure do not accommodate higher ceilings typically associated with these facilities in order to provide the necessary overhead signage, wayfinding and passenger communications structure which is standard in modern airports. It is this lack of vertical clearances which is a considerable detriment to the future use of the existing terminal structure.

Exhibit 2.8 View of Structure and Interstitial Condition

Source: Site Visit, Parsons Brinckerhoff, May 2015.

2.4.6 Mechanical Systems

A 2,403 MBH (thousand BTUs per hour) input cast iron boiler located in the first level boiler room (see **Exhibit 2.9**) supplies heating hot water to the passenger terminal building and the north terminal building. There are two base-mounted centrifugal pumps, one duty and one standby. The existing boiler was repaired in 2014 and is in like-new condition. A fire damaged the boiler in December 2013 leaving the terminal without heat while it was repaired. The boiler fuel supply is #2 fuel oil (diesel). The diesel is piped from an underground storage tank located across the terminal curb front. The tank has a capacity of roughly 5,000 gallons. Hot water from the boiler is piped to a multi-zone air handling unit (AHU) located on the main terminal's second level and serves the main terminal building. The same AHU has a DX cooling coil with refrigerant lines routed to a roof-mounted air-cooled condensing unit. Pneumatic actuators control the multi-zone dampers on the supply air zone branch ducts.

Hot water from the terminal boiler is also piped through the tunnel to a multi-zone AHU located in the north terminal building's basement to serve that structure. The same AHU has a DX cooling coil with refrigerant lines routed to a grade-mounted air-cooled condensing unit. Pneumatic actuators control the multi-zone dampers on the supply air zone branch ducts. There is an abandoned fin-tube hot water perimeter heating system in the north terminal building that is shown on the 1968 plans which used to be supplied by the terminal boiler.

Exhibit 2.9 Boiler Room

Source: Site Visit, Parsons Brinckerhoff, May 2015.

The 1983 south main terminal addition is heated and cooled by a nominal 6-ton air-cooled heat pump unit located outside on grade, west of the passenger holding area. Supplemental hot water unit heaters with propeller fans serve various spaces throughout the facility.

The facility does not have a building automation system (BAS) for the HVAC equipment. The existing obsolete pneumatic control system does not allow for single point control for the facility via a local computer or internet based control system which will mostly likely improve occupant comfort and energy usage. Direct digital controls (DDC) would be appropriate for new equipment.

Residential style ceiling fans are in use in several public areas. This suggests that renovations and repurposing of spaces over time have altered HVAC loads.

There is no natural gas service to the site.

Aside from regular maintenance issues and the occasional replacement/upgrade of equipment that is expected in a 47 year old building, the systems were found to be in working order, although mostly as old as the original construction. In general, most systems are from original construction in either 1968 or 1983, have been expanded through the years and are approaching or beyond their anticipated life of service.

2.4.7 Electrical Systems

2.4.7.1 *Lighting Systems*

There are a variety of lighting styles and technologies in use throughout the main terminal and the north terminal building: T-12 and T-8 fluorescent 2x4 and linear fixtures, and can lights. There has been an effort lately by the Airport to replace T-12 fluorescent lamps with T-8 and some LED retrofits.

Emergency egress lighting is provided by battery ballasts in select individual fluorescent fixtures along with ‘bug-eye’ emergency lights.

2.4.7.2 *Power Systems*

Power is supplied to the north terminal building from a utility-owned pad-mounted transformer and meter located across the front drive. The system is 208/120V, 3-phase, 4-wire and supplies a 1,600A main distribution panel (MDP) located in the basement. The MDP feeds several panels in the north terminal building and provides power to the main terminal via the utility tunnel. Panel MDP is floor-standing equipment, was recently replaced, and is in very good condition. However, the MDP currently sits on bricks (see **Exhibit 2.10**).

This is not a safe installation, is not in accordance with the manufacturer’s installation instructions and violates NEC 110.13(A) which requires electrical equipment to be firmly secured to the surface on which it is mounted. At the time of the survey, there was standing water under and in front of the MDP. This installation should be addressed by removing the bricks, providing proper seismic bracing for the panel and a concrete housekeeping pad or similar structure to keep the panel out of the water. The water leak should be fixed or redirected to prevent the safety hazard to personnel of working on the panel while standing in water.

Panel MDP supplies the power feed to the Terminal with conduits running through the tunnel to Panel D-1 located in the main terminal’s boiler room. Panel D-1 feeds the panels within the original 1968 portion of the main terminal building. The 1983 main terminal expansion introduced a second electric utility service. Power is supplied to the 1983 addition from a utility-owned pad-mounted transformer and meter located across the terminal curb front. The system is 208/120V, 3-phase, 4-wire and supplies a 600A panel PP1 located in the mechanical room adjacent to the south public entrance. Panel PP1 supplies power to the 1983 expansion areas. Over the years, circuits from panels in both the 1968 and the 1983 sections have been run through each other for various minor projects.

This arrangement of having two different power supplies to the Terminal Building, while it may have been approved by the authority having jurisdiction at the time, is not recommended. Neither MDP nor PP1 are labeled as service disconnects and neither indicates that the other disconnect switch exists in the building. This can be a safety hazard for fire first responders who need to shut off main power to the entire building. Both main disconnect means should be consolidated into one device, or the two devices should be collocated. Or, if the current arrangement is still acceptable to the fire marshal, at a minimum, panels MDP and PP1 should be clearly labeled as service disconnects and each should be clearly labeled indicating the location of the other within the building.

Exhibit 2.10 Panel MDP

Source: Site Visit, Parsons Brinckerhoff, May 2015.

The only major discrepancy between the 1968/1983 plans and the current conditions is that the original stand-by generator that served the both the main terminal and the north terminal building has been removed and all electrical power is now on utility without back-up power.

Aside from regular maintenance issues and the occasional replacement/upgrade of equipment that is expected in a 47 year old building, the systems were found to be in working order, although mostly as old as the original construction. In general, most systems are from original construction in either 1968 or 1983, have been expanded through the years and are approaching or beyond their anticipated life of service.

2.4.7.3 *Special Systems*

As buildings have been added to and re-purposed over time, so too have the communications and security systems been extended, removed and new systems installed in various places. The systems have several hub locations and panels located in unlocked spaces such as maintenance garages and open closet areas. While these areas may be accessible only from the airside to Security Identification Display Area (SIDA)-cleared personnel, they are not in locked spaces. This leaves the equipment open to accidental or intentional tampering.

- *Fire Alarm* - Neither the main terminal nor the north terminal building have fire alarm systems. Some make-shift sleeping quarters were observed in the main terminal and north terminal buildings for use by the TSA, airline staff and Airport Public Safety Office/ARFF staff. These areas should be reviewed for fire alarm and smoke detection requirements.

- *Access Control* - Card readers are at exterior doors and are wired back to the hub in the main terminal's maintenance garage. Card readers are also located at each at perimeter fence gate which communicate wirelessly back to the same control panel. Wireless antennae are mounted on an apron light pole.

- *Surveillance Camera System* - Surveillance *c*ameras monitor some interior and most exterior public areas as well as the exterior aircraft boarding location. The camera monitoring station, hub equipment and digital video recorder are all located in the Terminal Safety Office.

- *Public Address* – The Terminal has a public address system with the hub equipment located in the boiler room.

- *Telephone/Network*- Telephone service is provided by CenturyTel. Several telephone panels are located throughout the main terminal and north terminal building. The panels appear dated to the original construction and while some wiring may be abandoned there are new communication components and network cabling present. Major telephone panels are located in the main terminal on the second level, the north terminal building basement and first floor communications room. The empty first floor communications room in the north terminal building appears at one time to have been full of equipment for functions that are now no longer needed; most equipment has been removed. Equipment that is remaining appears to still be in use. It should be noted that a junction box in this room currently contains airfield lighting control cables. These cables are still in use. The cables originate in the Airfield Lighting Vault (Bldg 230) to the north, pass through the north terminal building and run underground across the airfield to the FAA ATCT. Any modification to the north terminal building needs to identify these cables to remain and protect in place or design for their relocation by first providing new cables so that the system remains operational during construction.

- *Fiber Optic Service* – Fiber optic service is provided by Socket.

- *Internet Service / WiFi* – Internet service is provided by the City of Columbia. Wi-Fi service inside the Terminal is provided by iZones.

2.5 Ground Transportation Facilities

Existing ground transportation facilities are shown on **Exhibit 2.11** and are summarized in the following sub-sections.

2.5.1 Parking

Three parking lots with a total of 554 parking spaces are available for commercial service passengers: the primary parking lot located in front of the main terminal building containing 284 spaces, an overflow lot across Airport Drive containing 146 spaces (63 asphalt paved stalls, 83 gravel paved stalls), and the parking lot in front of the Airport's Fixed Based Operator (FBO) facility containing 124 spaces.

The FBO surface lot is not for exclusive use of commercial service passengers as its primary purpose is to support operations at the FBO – Central Missouri Aviation. Passenger access to the main terminal building from the FBO lot is not direct, as passengers must walk either through the primary lot or along the terminal access road to reach the terminal. Further discussion on the limitation of available spaces for the FBO lot in relation to commercial service passenger needs is included in Chapter 4 – Facility Requirements.

Airport employees can park in any of the available parking lots. Parking is currently free at all public lots at COU.

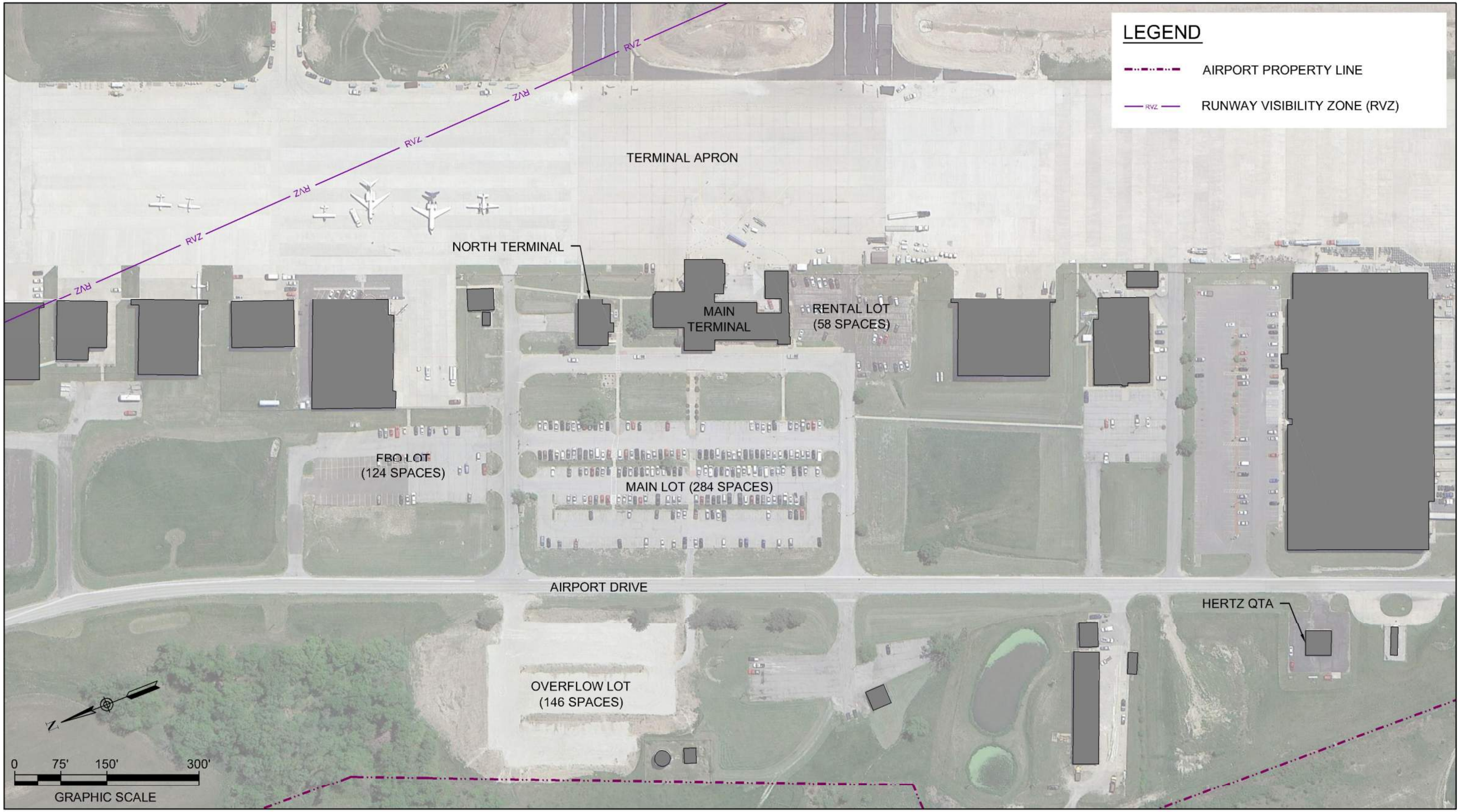
2.5.2 Access Roadways and Curb front

Access to the airport is provided by Airport Drive. Predominately, traffic comes from US Highway 63, via Route H, though a small amount of traffic utilizes Rangeline Road to the east of Angel Lane to the south. Airport Road is a 24 foot wide, two lane, asphalt road with a rural section and delineation markings along the center and edges. The surrounding roadway has similar rural sections.

In 2012, the Missouri Department of Transportation (MoDOT) reported the annual average daily traffic (AADT) on Route H is 1,207 vehicles per day (vpd). Utilizing regional projected population growth rates, the AADT was adjusted to year 2014. Boone County Public Works has also completed AADT counts on surrounding Rangeline Road, Clinkenbeard Road, and Route H east of Clinkenbeard Road. Each of these roads was found to have an AADT of 350 vpd. Based on this data, 700 vpd on Route H were assumed to be non-airport traffic, while 669 vpd were assumed as airport traffic. Commercial Aviation parking patterns appear to support this rate.

Estimations of the peak hour traffic were derived from the AADT and are shown in the **Table 2.3**. Currently, a dedicated right turn lane for eastbound Route H to Airport Road is warranted.

Exhibit 2.11 Ground Transportation Facilities



COLUMBIA Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

Ground Transportation Facilities

EXHIBIT
2.11

Table 2.3 Airport Area Traffic Data

Roadway	Year	AADT (vpd)	Peak Hour Directional Traffic (vph)
Route H	2012 2014 (est.)	1,207 1,369	174 197
Airport Road	2014 (est.)	669	117 – AM 134 – PM

Source: Missouri Department of Transportation; Engineering Surveys and Services analysis, 2015.

The passenger terminal is accessible via Airport Drive, a two-lane road, from either Route H to the north or Angel Lane to the south. Operations Drive serves as the terminal circulation route and curb front access roadway off of Airport Drive. Operations Drive is a one-way, two lane roadway from its southern connection on Airport Drive until just north of the north terminal building. From this point until the northern connection on Airport Drive, it is a two-way, two lane roadway providing access to the primary and FBO parking lots.

The current configuration of Operations Drive presents a potential operational and safety concern as passenger traffic increases in light of the two-way nature of the exiting portion of the roadway.

The portion of Operations Drive that serves as the terminal curb front is approximately 300 feet in length, with an effective curb front length of approximately 260 feet. Taxis typically wait for arriving passengers along the southern portion of the inner curb front lane in proximity to the exit from baggage claim. These commercial vehicles further reduce the available curb front length for passenger vehicles picking up and dropping off at the curb front.

2.5.3 Rental Car

There are currently two on-airport rental car agencies (Enterprise and Hertz) that occupy terminal counter space and have an on-site rental lot. The rental car ready-return lot is located directly south of the Main Terminal. Access to the lot is available directly from Operations Drive. There are 58 parking spots currently available.

Hertz has an on-airport quick-turn around (QTA) facility for its vehicles. It is located along Airport Drive south of the terminal, across from the US Postal Service facility. Vehicles for Enterprise are ferried back and forth from their facility in Columbia or Jefferson City for cleaning and turnaround.

2.6 General Aviation and Support Facilities

2.6.1 General Aviation

The general aviation facilities at the Airport consist of one FBO (Central Missouri Aviation), conventional hangars, aircraft maintenance businesses, a cargo sortation facility, and apron space. The general aviation facilities at Columbia regional Airport are located to the west of Runway 2-20 with one additional box hangar located along the southern portion of Runway 13-31.

Central Missouri Aviation (CMA) provides aircraft fueling, aircraft maintenance services, hangar and apron storage, flight instruction, as well as aircraft charters.

Overall, there is approximately 130,000 square feet of hangar space at COU. Nearly 73,000 square feet is owned/operated by CMA. The remaining 57,000 square feet are private business hangars. There are also approximately 60 marked tie-down spaces in front of the CMA main office and maintenance hangar[7].

All but two of the general aviation hangars are located to the north of the passenger terminal building. One CMA hangar and one private hangar are located south of the terminal on either side of the USPS facility.

The current general aviation apron area is divided into a north and south area along the Runway 02-20 flight line. This division is due to the passenger terminal apron area and the associated Security Identification Display Area (SIDA). The existing SIDA limits on the apron extend from just south of the apron vehicular access gate adjacent to the north terminal building to just north of Hangar #16.

The current Airport Layout Plan identifies two areas for general aviation expansion. The south hangar expansion area located adjacent to Taxiway A and south of the USPS facility shows an additional 454,700 square feet of additional hangar development with an associated apron expansion. The north hangar expansion area is located adjacent to Taxiway B west of existing facilities showing an additional 68,700 square feet of additional hangar development and associated apron expansion.

2.6.2 Aircraft Rescue and Fire Fighting

Airports that serve scheduled and unscheduled air carrier flights are required to provide Aircraft Rescue and Fire Fighting (ARFF) facilities and equipment. The ARFF crew conducts firefighting rescue operations and fire prevention services, and is the medical first responder for an aircraft accident or incident. The Airport is currently classified as a Class I Part 139 facility.

The Columbia ARFF staff also functions as the airport operations staff and provides police safety in the terminal area. COU ARFF staff performs the following functions at the Airport:

- Site policing and first-response
- AOA and SIDA security functions
- Airfield escorts within AOA or SIDA as required
- Non-secure fire and EMS first-response
- Operational coordination, Part 139 reporting, and airfield daily inspections
- Airside FAR Part 139 ARFF response

FAR Part 139 requires Columbia to have two vehicles available. The response vehicles include two ARFF Index B trucks. Both trucks are capable of holding 1,500 gallons of water and 200 gallons of foam. In addition to the firefighting trucks, the ARFF facility also has an operations vehicle.

The existing ARFF facility (see **Exhibit 2.12**) is attached to the north side of the passenger terminal building. The ARFF currently houses two bays for fire rescue vehicles, the Airport's security and communications operations area and other amenities. The vehicle bays are narrow and do not allow for safe and efficient egress needed to meet the recommended response times by the ARFF vehicles.

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[7] Columbia Regional Airport Master Plan Update, RS&H, September 2009.

2.6.3 Airport Traffic Control Tower

The ATCT, which is contract by Midwest Air Traffic Control Services Inc., is open from 7 am to 9 pm central time, and is responsible for air traffic separation and communications occurring on the runway and taxiway movement areas, and within the Class D airspace surrounding the Airport. The ATCT building is located on the east side of the airfield with separate vehicle access.

2.6.4 Airport Maintenance

Columbia Regional Airport owns and operates a variety of maintenance equipment that is needed for snow removal, ground maintenance, pavement and facilities maintenance, and general repairs. Airport maintenance equipment is held in two buildings. The maintenance office building and snow removal building are located on the west side of Airport Drive south of the passenger terminal building.

Exhibit 2.12 Existing ARFF Facility

Source: City of Columbia staff, August 2015.

2.6.5 Cargo Facilities

The approximate 22,000 square-foot air cargo building located along the north side of the Runway 2-20 flight line, had been used by DHL as a cargo sort facility. The same building has lean-to-offices on opposite sides of the hangar. Should dedicated air cargo service resume at Columbia in the future, it is anticipated it would occupy the same building as previously used for cargo operations. The US Postal Service facility, located approximately 800 feet south of the passenger terminal, does not, and would not likely operate aircraft to support the mail facility at Columbia.

2.6.6 Airport Fuel Facilities

The Airport owns a dedicated fuel farm containing storage for a total of 32,000 gallons of 100LL and Jet-A fuel. Fueling dispensing is provided by the fixed base operator (Central Missouri Aviation) using fuel trucks.

2.6.7 Airfield Lighting Vault (ALV, Bldg 230)

The ALV houses four FAA Type L-828 constant current regulators (CCR) for the airfield lighting circuits. Each CCR is 6.6A output with 208V 1-phase input from a panel inside the ALV. A 150kW diesel generator located inside the ALV supplies power to the entire vault. Electrical service is supplied from a pad-mounted transformer and meter just outside. The adjacent Gate 4 is also powered from the ALV and is on generator power.

CCR Summary
CCR RW 13-31, 10kW, 3-step brightness
CCR RW 2-20, 20kW, 5-step brightness
CCR TW A, 30kW, 3-step brightness
CCR TW B, 10kw, 3-step brightness

As noted above, in the basement of the North Terminal Complex is a junction box that contains airfield lighting control cables. These cables are still in use. The cables originate in the ALV, pass through the North Terminal Complex and run underground across the airfield to the air traffic control tower. Any modification to the North Terminal Complex needs to identify these cables to remain and protect in place or design for their relocation by first providing new cables so that the airfield lighting control system remains operational during construction.

2.6.8 Utilities

2.6.8.1 *Electrical Service*

Boone Electric Cooperative (BEC) serves the Airport with a single feed. Discussions with BEC representatives indicate that in the next year BEC will extend a second, 13.8 kV, three phase line from the north to serve the Airport. BEC indicates that they have adequate capacity to serve the Airport including a 20% growth in electric demand.

2.6.8.2 *Water System*

The Airport is served by Columbia Water and Light (CW&L) 12 inch and 16 inch diameter lines along the northern and southern sections of Airport Road, respectively. These lines connect to Consolidated Public Water Supply District Number 1 (CPWSD#1) on the north and south side of the Airport. The City of Columbia and CPWSD#1 have an agreement for CPWSD#1 to provide 3,000 gallons per minute.

2.6.8.3 *Sanitary Sewer*

Airport facilities are served by an offsite land application system south of the Airport. This wastewater treatment facility (WWTF) is permitted through the Missouri Department of Natural Resources (MDNR) under permit number MO-0092924. The facilities parallel to Runway 2-20 are served by an 8 inch diameter gravity sewer system. The Southern Boone County Fire

District's fire station to the north is served by a pump station with a 2 inch force main that flows into the 8 inch gravity sewer system to the south. The gravity sewer flows into a two cell lagoon to the southwest of the terminal building on the west side of Airport Drive.

The two cell lagoon has a capacity of 20,000 gallons per day. MDNR lists the actual average flow as 16,500 gpd while the City of Columbia flow tests indicate an actual average flow of 8,000 gpd. Wastewater is then pumped from these lagoons to the south in a 2.5 inch diameter force main. The pump station is equipped with two ABS grinder pumps rated for 33 gpm at 140 feet of total dynamic head (TDH).

The 2.5 inch force main discharges into single cell lagoon at East New Salem Lane. Wastewater is pumped out of this lagoon and land applied south of East New Salem Lane. The water is pumped from the irrigation lagoon with a floating 25 hp pump capable of 330-445 gpm. The land application system is comprised of 12 Rainbird sprinkler heads in three rows. The permitted design capacity of the system is 14 inches per year over 22.5 acres or 16 gpm.

3 AVIATION ACTIVITY FORECAST

In planning for the future growth of any airport, it is important to understand the context within which potential increases in aviation activity are likely to occur. Several indicators of aviation activity including regional and local trends in aviation were used to develop an aviation activity forecast for Columbia Regional Airport (COU or the Airport). The forecast period covers a 20-year period from 2015 to 2035 and the forecast elements include data at five- and ten-year intervals (2020, 2025, and 2035).

The aviation demand forecast's purpose is to provide one of the parameters for planning future aviation facilities. Aviation forecasting is not an "exact science" so experienced aviation judgment and practical considerations will influence the level of detail and effort required to establish reasonable forecasts and subsequent airport development decisions. Aviation activity that develops in future years may differ from the forecasts developed in this chapter as a result of future changes in local conditions, the dynamics of the aviation industry, as well as economic and political changes for the local service area and the nation as a whole. Future facility improvements should be implemented as demand warrants rather than at set future timeframes. This will allow the Airport to respond to changes in demand, either higher or lower than the forecast, regardless of the year in which those changes take place.

Trends in the national aviation forecasts developed by the Federal Aviation Administration (FAA) were used to provide support to the underlying assumptions for the projections of aviation activity and the other elements of the forecast contained herein. The FAA develops its estimates of such trends through conversations with various segments of the aviation community as well as projected economic indicators. In addition, the aviation demand forecasts contained in COU's most recent Airport Master Plan were reviewed to further inform the forecasts contained herein.

The following are discussed in the remainder of this chapter:

- Historical Aviation Activity
- Factors Affecting Future Aviation Demand
- Base Case Forecast
- Forecast Scenarios
- Peak Period Activity
- Forecast Summary

3.1 Historical Aviation Activity

This section presents a general overview of long-term historical trends of aviation activity at COU.

3.1.1 Airlines Serving the Airport

As of April 2015, COU is served by one commercial service passenger airline, American Airlines, providing nonstop service to Chicago O'Hare International Airport (ORD) and Dallas-Ft. Worth International Airport (DFW). Both routes are currently served with two daily departures each using a Canadair Regional Jet (CRJ) 700 aircraft with 65 seats.

3.1.2 Enplaned Passengers

COU is classified as a non-hub airport by the FAA. The FAA classification is based on the percentage of enplanements at an airport compared to the total number of enplanements in the United States. The non-hub classification is applied to airports with more than 10,000 enplaned passengers, but less than 0.05 percent of the nation's enplaned passengers.

Table 3.1 and **Exhibit 3.1** present historical enplaned passenger data at COU between 1995 and 2014.

Table 3.1 Historical Enplaned Passengers (1995-2014)

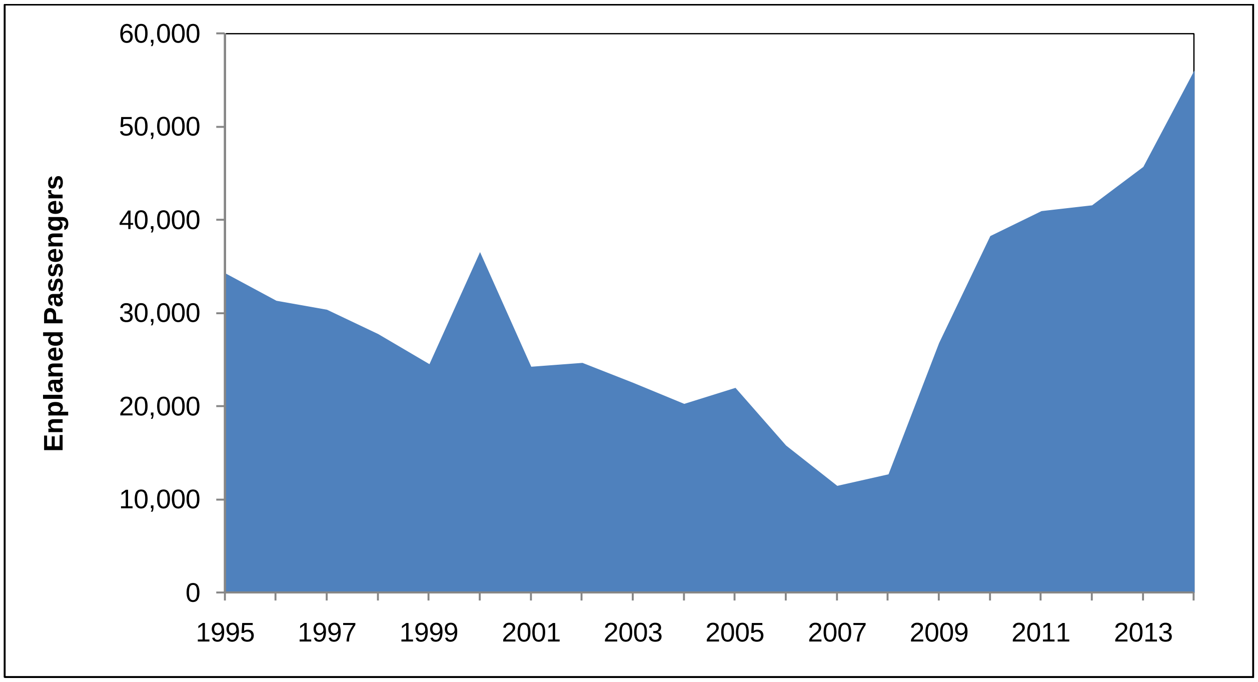
Year	Total Enplanements[1]	Annual Growth
1995	34,349	--
1996	31,345	-8.7%
1997	30,367	-3.1%
1998	27,806	-8.4%
1999	24,537	-11.8%
2000	36,573	49.1%
2001	24,282	-33.6%
2002	24,682	1.6%
2003	22,548	-8.6%
2004	20,268	-10.1%
2005	22,005	8.6%
2006	15,809	-28.2%
2007	11,516	-27.2%
2008	12,719	10.4%
2009	26,842	111.0%
2010	38,293	42.7%
2011	40,990	7.0%
2012	41,573	1.4%
2013	45,741	10.0%
2014 [2]	56,080	22.6%
Compounded Annual Growth Rate		
1995-2004	-5.7%	
2004-2008	-11.0%	
2008-2014	28.1%	
1995-2014	2.6%	
2004-2014	10.7%	

Notes:
1. Total enplanements for 2000-2013 include both commercial service and charter service passenger activity.
2. 2014 enplanements are estimated by combining actual commercial carrier enplanements with an estimate for charter activity.

Source: Airport Management; Compiled by Parsons Brinckerhoff

The number of annual enplaned passengers decreased overall between 2004 and 2008. Starting in 2009, annual enplaned passengers recovered to 2004 levels and have increased each year between 2007 and 2014.

Exhibit 3.1 Historical Enplaned Passengers



Source: Airport Management; Compiled by Parsons Brinckerhoff

3.1.3 Aircraft Operations

Table 3.2 and **Exhibit 3.2** present the historical aircraft operations and activity levels at COU by category.

Table 3.2 Historical Aircraft Operations by Category (2004-2014)

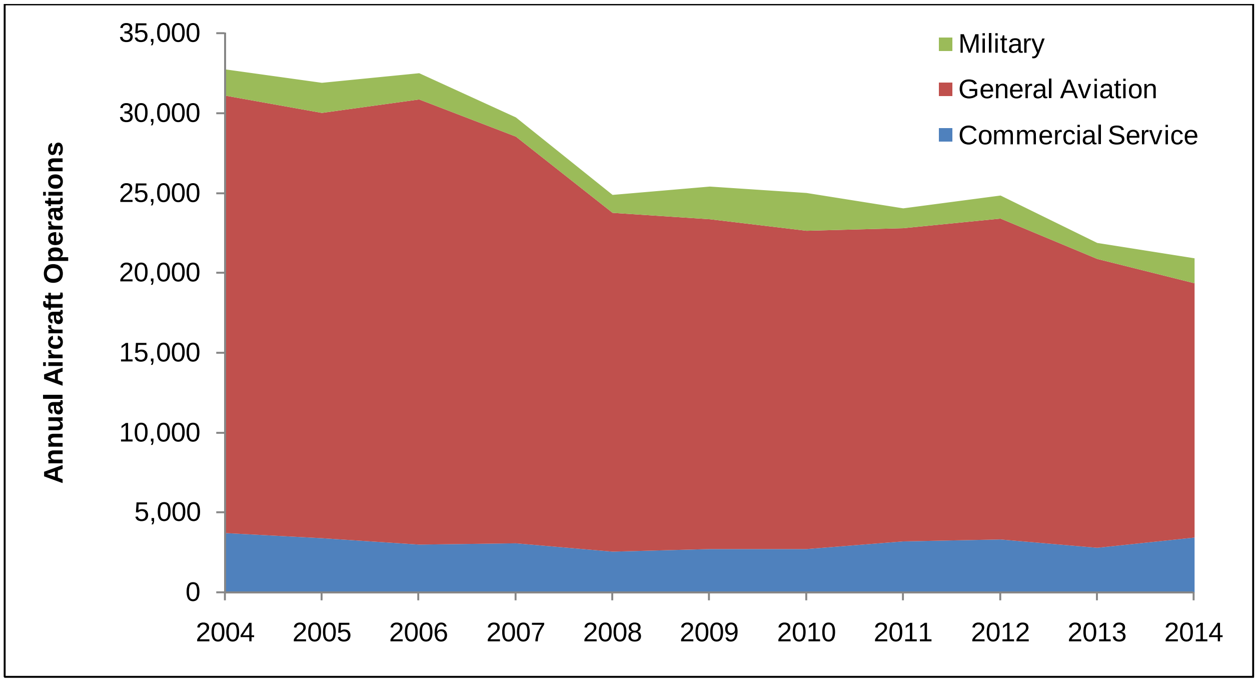
Year	Commercial Service[1]	General Aviation	Military	Total Operations
2004	3,723	27,379	1,642	32,744
2005	3,402	26,641	1,855	31,898
2006	3,010	27,864	1,619	32,493
2007	3,076	25,468	1,211	29,755
2008	2,562	21,194	1,133	24,889
2009	2,707	20,657	2,058	25,422
2010	2,736	19,913	2,360	25,009
2011	3,179	19,643	1,241	24,063
2012	3,324	20,066	1,478	24,868
2013	2,804	18,067	1,031	21,902
2014	3,453	15,913	1,572	20,938
Compounded Annual Growth Rate				
2004-2008	-8.9%	-6.2%	-8.9%	-6.6%
2008-2014	5.1%	-4.7%	5.6%	-2.8%
2004-2014	-0.8%	-5.3%	-0.4%	-4.4%

Note:

1. Commercial service operations include air carrier, air taxi, and commuter operations categories.

Sources: FAA Terminal Area Forecast (2004-2013), Air Traffic Control Tower Data (2014); Compiled by Parsons Brinckerhoff.

Exhibit 3.2 Historical Aircraft Operations by Category



Sources: FAA Terminal Area Forecast (2004-2013), Air Traffic Control Tower Data (2014); Compiled by Parsons Brinckerhoff.

As shown in Table 3.2 and Exhibit 3.2, commercial service and military operations have remained relatively stable since 2004. General aviation operations, which represent the large majority of operations at COU, have decreased to 58 percent of 2004 levels.

3.2 Factors Affecting Future Aviation Demand

Aviation activity at COU will be influenced by several factors, including national economic and aviation trends, local aviation trends, and the COU service area characteristics. These factors are reviewed below.

3.2.1 National Economic & Aviation Trends

This section presents an overview of the national economic, as well as national and local aviation trends. The *FAA Aerospace Forecast, Fiscal Years 2015 – 2035* (FAA Aerospace Forecast)[1] include a description of national factors that influence overall aviation demand including economic measures such as U.S. Gross Domestic Product (GDP) and the Consumer Price Index (CPI). In addition to the economic factors, trends related to the nation's overall enplanement growth, available seat miles, load factors and the aircraft manufacturing and purchases, specifically influence the outlook related to the overall aviation activity in the U.S. These factors coupled with local aviation trends will be the basis for the forecasts developed for COU. The trends in the economic indicators and national aviation demand forecasts are summarized in the following bullets.

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[1] This publication was released in March 2015. Fiscal year refers to the Federal fiscal year, which begins October 1st and ends September 30th each year.

- The U.S. economy is projected to continue to recover from the recession that began in December 2007 and ended during 2009; albeit at slower rates of recovery than has been experienced from previous recessions.
- National enplanement growth is expected to follow the trend of the economic recovery with more robust growth during the first year of the forecast period followed by stabilization through 2035 with an average annual growth rate of 2 percent over the next 20 years.
- Higher growth rates are expected for mainline carriers compared to regional carriers in the U.S. Mainline carrier enplanements are anticipated to grow at an average annual growth rate of 2 percent over the next 20 years compared to 1.7 percent for regional carriers.
- The total number of fixed wing general aviation aircraft is expected to remain stable during the forecast period; however, there is a shift away from piston engine aircraft to turbo engine aircraft that is expected to occur.
- General aviation aircraft operations are expected to remain stable at 2015 levels throughout the forecast period.

The following sections provide an overview of the economic and aviation trends, as well as the FAA Aerospace Forecast's projections of aviation demand through 2035, the last year of this study.

3.2.1.1 National Economic Trends

Table 3.3 presents the historical and projected GDP and CPI. GDP is a measure of overall economic growth and CPI is a measure of economic inflation (i.e., price increases). As shown in the table, GDP declined 3.4 percent from 2008 to 2009. This decrease was a result of the recession experienced in the U.S. that began in December 2007. Since the decline from 2008 to 2009, GDP has increased each year, but recovery has been slower than the recoveries from past recessions. One of the unique features about the economic recovery (now in its sixth year) has been the slow improvement in the nation's unemployment rate.

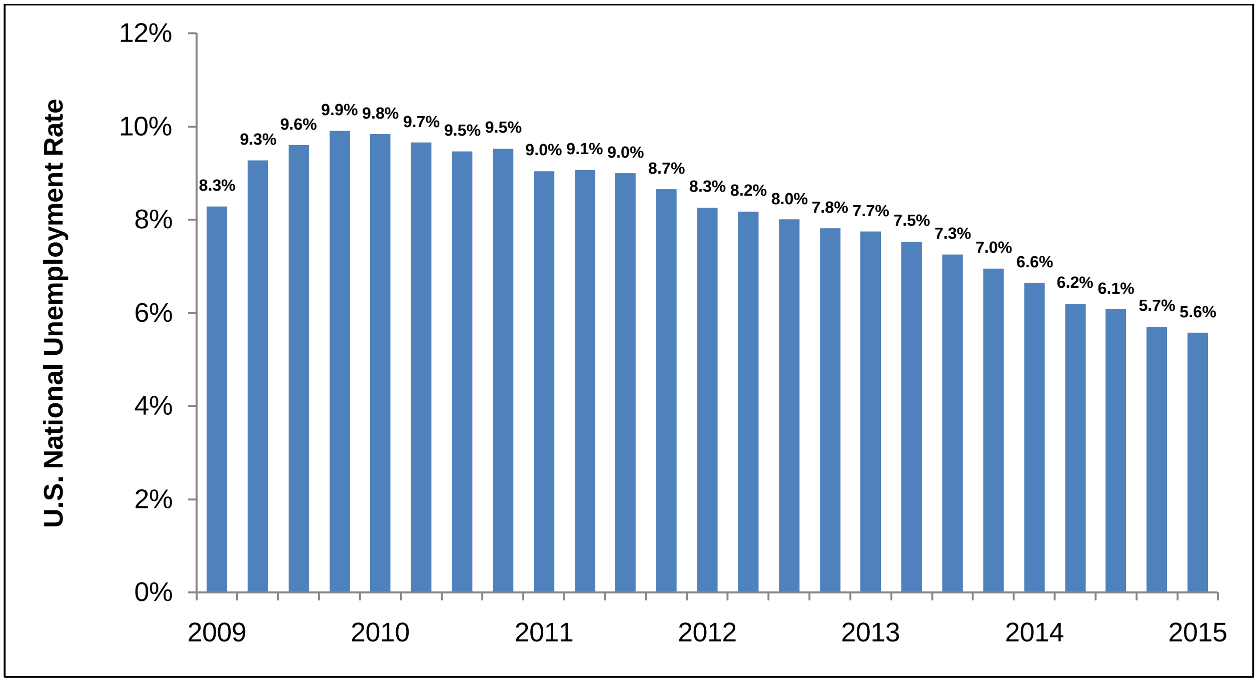
According to the FAA Aerospace Forecast, there have been five economic expansions in the U.S. since 1960 that have lasted longer than 48 months, including this latest recovery. In these prior expansions, the unemployment rate on average has declined about one-third from its highest point by the fourth year. The unemployment rate at its highest was 9.9 percent in the last quarter of 2009, and if prior experience held true, the unemployment rate for 2013 should have been around 6.7 percent. However, for the fourth quarter of 2013, the unemployment rate for the nation was 7.0 percent. This slower recovery of employment has been a contributing factor to the slower than average recovery from the recession. Unemployment rate decline did not surpass the rate of decline as experienced in three years in prior recessions until the middle of the fifth year of recovery (2014). **Exhibit 3.3** presents quarterly unemployment rates for the nation from 2009 through the first quarter of 2015.

Table 3.3 Historical and Projected Gross Domestic Product and Consumer Price Index

Fiscal Year	GDP		CPI	
	(Billions, 2009$)	% Change	(1982-1984) = 100	% Change
2007	14,805.0		2.1	
2008	14,934.1	0.9%	2.1	4.4%
2009	14,427.5	-3.4%	2.1	-0.3%
2010	14,684.5	1.8%	2.2	1.7%
2011	14,957.8	1.9%	2.2	2.6%
2012	15,308.3	2.3%	2.3	2.4%
2013	15,589.7	1.8%	2.3	1.6%
2014	15,980.6	2.5%	2.4	1.6%
2015	16,397.3	2.6%	2.4	0.3%
2016	16,798.3	2.4%	2.4	1.7%
2017	17,257.2	2.7%	2.5	2.1%
2018	17,673.6	2.4%	2.5	2.2%
2019	18,132.1	2.6%	2.6	2.4%
2020	18,638.0	2.8%	2.6	2.4%
2021	19,124.8	2.6%	2.7	2.5%
2022	19,579.5	2.4%	2.8	2.3%
2023	20,041.3	2.4%	2.8	2.2%
2024	20,500.8	2.3%	2.9	2.3%
2025	20,974.2	2.3%	3.0	2.3%
2026	21,464.3	2.3%	3.0	2.2%
2027	21,960.2	2.3%	3.1	2.1%
2028	22,473.3	2.3%	3.1	2.1%
2029	22,991.5	2.3%	3.2	2.0%
2030	23,523.3	2.3%	3.3	2.0%
2031	24,058.6	2.3%	3.3	2.0%
2032	24,606.6	2.3%	3.4	2.1%
2033	25,174.8	2.3%	3.5	2.1%
2034	25,754.7	2.3%	3.6	2.0%
2035	26,345.0	2.3%	3.6	2.1%
Compounded Annual Growth Rates				
2007-2014	1.1%		2.0%	
2009-2014	2.1%		2.0%	
2014-2020	2.6%		1.9%	
2020-2035	2.3%		2.1%	
2014-2035	2.4%		2.1%	

Source: FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

Exhibit 3.3 Historical Unemployment Rates



Source: U.S. Bureau of Labor Statistics; Compiled by Parsons Brinckerhoff

Even with this slower recovery than in past recessions, GDP is projected to increase at a compounded annual growth rate (CAGR) of 2.6 percent annually from 2014 to 2020, with the growth from 2014 to 2015 being similar. After 2020, year-over -year GDP growth remains relatively consistent for the remainder of the projection period indicating a stabilization of the economy.

Because of the recession, the unemployment rate in the U.S. increased from 5.0 percent in December 2007 to 9.9 percent in the fourth quarter of 2009. This increase resulted in falling demand for oil and lower oil prices. As a result, the CPI declined 0.3 percent from 2008 to 2009. This was the first decline in this economic measure since 1955. Since 2009, growth in CPI has increased at year-over-year rates ranging from 1.6 percent (2012 to 2013 and 2013 to 2014) to 2.6 percent (2010 to 2011).

CPI is projected to increase at an annual compounded growth rate of 1.9 percent from 2014 to 2020. The projected year-over-year increases in CPI after 2020 follow the same pattern as the increases in GDP but at a lower rate of growth, with the CAGR from 2020 to 2035 of 2.1 percent compared to 2.4 percent for GDP during the same time period.

3.2.1.2 National Aviation Trends

This section presents trends and projections for the U.S. for both the commercial and general aviation markets, as these are the markets that make up the main categories of aviation demand for COU.

3.2.1.2.1 Commercial Aviation

Commercial aviation activity trends and projections in the FAA Aerospace Forecast are divided into two categories – mainline carriers and regional carriers. Mainline carriers operate their own flights using their own equipment under their own brand name. These carriers, such as Delta Air Lines, United Airlines and American Airlines, typically cater to business segments such as the short-range air shuttle, low-cost, or premium-service flights. These segments normally would not support the traffic or revenue yield needed for the traditional operation of larger mainline aircraft with over 100 seats between selected city pairs with regional affiliates. These regional affiliates make up the regional carrier category presented in the FAA Aerospace Forecast. Commercial aviation activity at COU currently consists of activity on a single regional carrier. Therefore many of the projections in the FAA Aerospace Forecast presented herein are divided into the mainline and regional categories.

Table 3.4 presents the historical and projected passenger enplanements from 2004 to 2035. As shown in the table, enplanements have fluctuated in the last decade primarily due to the effects of the terrorist attacks of September 11, 2001, and the 2007-2009 economic recession. The FAA Aerospace Forecast indicates that total U.S. enplanements will increase at a CAGR of 2.0 percent from 2014 to 2035, with the largest year over year increases corresponding with the GDP and CPI increases discussed previously.

More important to the aviation demand forecasts for COU, is the trends in U.S. regional carriers' enplanements. As shown in the table, regional carriers experienced much larger growth than the mainline carriers in the early part of the 2000s. However, following the recession, there has been a trend in airline consolidation, as well as “right” sizing flights that has contributed to recent year-over-year decreases in regional carrier enplanements from 2010 to 2014. In 2004, regional carriers made up about 20 percent of the total U.S. enplanement activity. However, despite decreases from 2010 to 2014, the share of regional carrier enplanements in the U.S. has increased to 21 percent indicating their importance in the U.S. aviation system. The share of regional enplanements is projected by the FAA to remain relatively stable at approximately 20 percent throughout the forecast period from 2014 to 2035.

Table 3.4 Historical and Projected U.S. Enplanements (in millions)

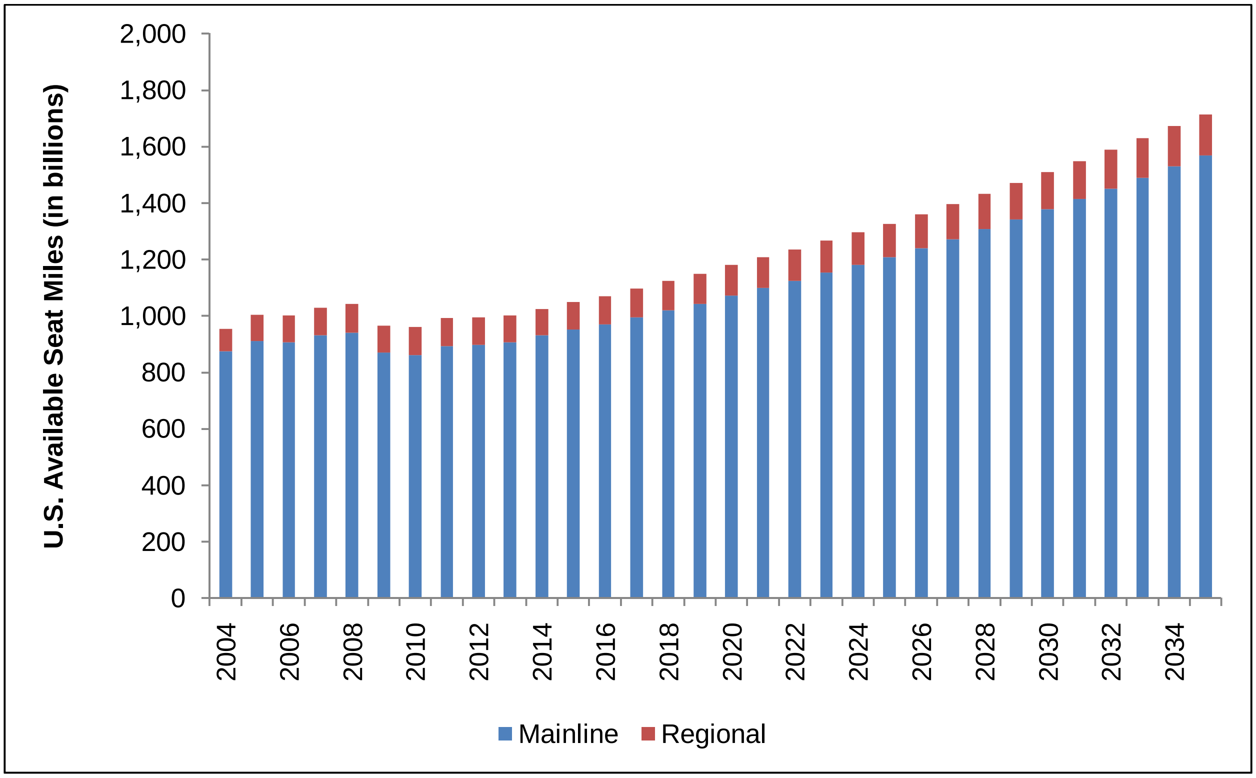
Fiscal Year	Regional Carriers	% Change	Mainline Carriers	% Change	Total Enplanements	% Change
2004	129.1		512.1		641.2	
2005	149.7	16.0%	539.3	5.3%	689.0	7.5%
2006	155.7	4.0%	581.3	7.8%	737.0	7.0%
2007	159.7	2.6%	604.1	3.9%	763.8	3.6%
2008	162.6	1.8%	596.5	-1.3%	759.1	-0.6%
2009	156.6	-3.7%	547.8	-8.2%	704.4	-7.2%
2010	164.4	5.0%	547.7	0.0%	712.1	1.1%
2011	164.1	-0.2%	567.0	3.5%	731.1	2.7%
2012	162.1	-1.2%	574.6	1.3%	736.7	0.8%
2013	158.4	-2.3%	581.1	1.1%	739.5	0.4%
2014	158.1	-0.2%	598.3	3.0%	756.3	2.3%
2015	161.5	2.2%	614.3	2.7%	775.8	2.6%
2016	164.0	1.5%	625.6	1.8%	789.5	1.8%
2017	166.9	1.8%	638.8	2.1%	805.8	2.1%
2018	169.7	1.6%	651.4	2.0%	821.1	1.9%
2019	171.7	1.2%	662.4	1.7%	834.1	1.6%
2020	174.6	1.7%	676.4	2.1%	851.1	2.0%
2021	176.9	1.3%	688.4	1.8%	865.3	1.7%
2022	179.3	1.4%	700.6	1.8%	879.9	1.7%
2023	182.1	1.5%	714.0	1.9%	896.1	1.8%
2024	184.6	1.4%	726.6	1.8%	911.1	1.7%
2025	187.3	1.5%	740.2	1.9%	927.4	1.8%
2026	190.2	1.5%	754.5	1.9%	944.7	1.9%
2027	193.6	1.8%	770.7	2.1%	964.2	2.1%
2028	197.2	1.9%	787.7	2.2%	984.9	2.1%
2029	200.8	1.8%	805.0	2.2%	1,005.8	2.1%
2030	204.5	1.8%	822.6	2.2%	1,027.1	2.1%
2031	208.2	1.8%	839.8	2.1%	1,048.0	2.0%
2032	211.9	1.8%	857.8	2.1%	1,069.7	2.1%
2033	215.8	1.8%	876.2	2.1%	1,091.9	2.1%
2034	219.6	1.8%	894.8	2.1%	1,114.4	2.1%
2035	223.3	1.7%	913.1	2.1%	1,136.5	2.0%
Compounded Annual Growth Rates						
2004-2014	2.0%		1.6%		1.7%	
2008-2014	-0.5%		0.1%		-0.1%	
2014-2020	1.7%		2.1%		2.0%	
2020-2035	1.7%		2.0%		1.9%	
2014-2035	1.7%		2.0%		2.0%	

Source: FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

Other factors that influence the projections of aviation demand include assumptions related to available seat miles (ASMs) and load factors. **Exhibit 3.4** presents the historical and projected ASMs for the U.S. by the categories of regional and mainline carrier. As shown in the exhibit, ASMs increased in the early 2000s in the aftermath of September 11, 2001 and then remained relatively stable from 2009 through 2012. In 2013 and 2014, ASMs increased approximately 1 percent and 2 percent over prior year levels, respectively. The FAA Aerospace Forecast indicates that ASMs will increase at a CAGR of 2.5 percent from 2014 to 2035.

In the near term ASMs for both regional and mainline carriers are expected to increase at a CAGR of 2.3 percent and 2.4 percent, respectively from 2014 to 2020. During the latter years of the forecast, growth in regional ASMs is projected to be lower than the mainline carriers at CAGRs of 2.0 percent and 2.6 percent, respectively from 2020 to 2035. Regional carriers' share of ASMs reached a high of 10.4 percent in 2010, which has declined to 9.2 percent in 2014. It is projected that the regional carriers' share of ASMs will decrease to approximately 8.5 percent by 2035.

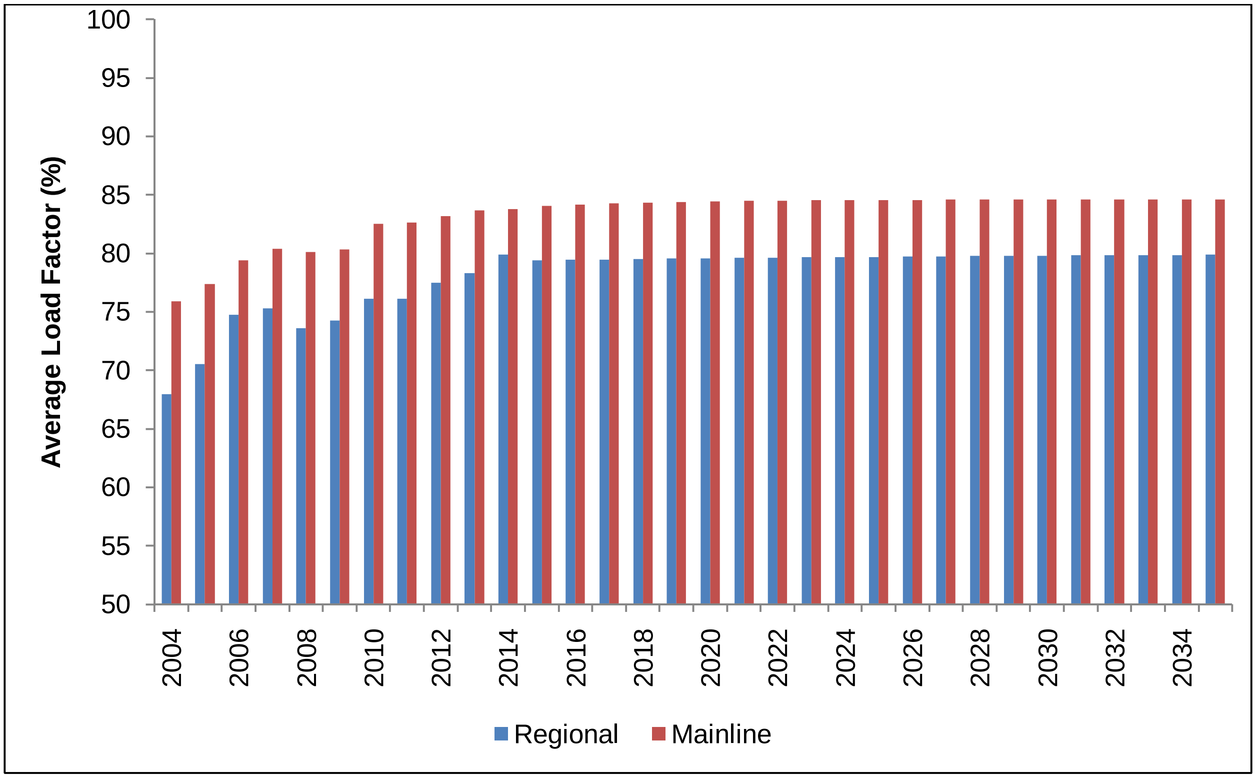
Exhibit 3.4 Historical and Projected ASMs (in billions)



Source: FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

Another factor that contributes to passenger growth is average load factor. This is a measure of how many seats are filled in an aircraft. **Exhibit 3.5** presents a comparison of the mainline and regional carriers' historical and projected average load factor from 2004 to 2035. As shown, both mainline and regional carriers' load factors increased from 2004 to 2014. The mainline and regional carriers' load factors are projected to remain relatively stable during the forecast period at approximately 85 percent and 80 percent, respectively. This translates into a system wide load factor for the projection period of approximately 84 percent given the large portion of traffic on mainline carriers.

Exhibit 3.5 Historical and Projected Average Load Factor



Source: FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

Trends in the type of regional aircraft being used will have an impact on the overall fleet mix forecast for COU. For example, as larger regional aircraft (CRJ 900 with 80 seats) become available, these aircraft may be used to absorb additional demand rather than adding frequencies with the CRJ 700 that currently operates at COU. **Exhibit 3.6** presents a comparison of the types of aircraft in the regional fleet in 2014 compared to the projected forecast for 2035. The biggest shift is in the over 40 seat category, which is projected to increase from a 77 percent share of the total regional fleet in 2013 to 97 percent in 2033. The increase in share in the over 40 seat category is due to a decrease in the share for all of the other categories. Also important to note with regard to the regional carrier fleet mix is that jet aircraft are projected to increase from a 74 percent share of the fleet in 2014 to 97 percent of the fleet in 2035.

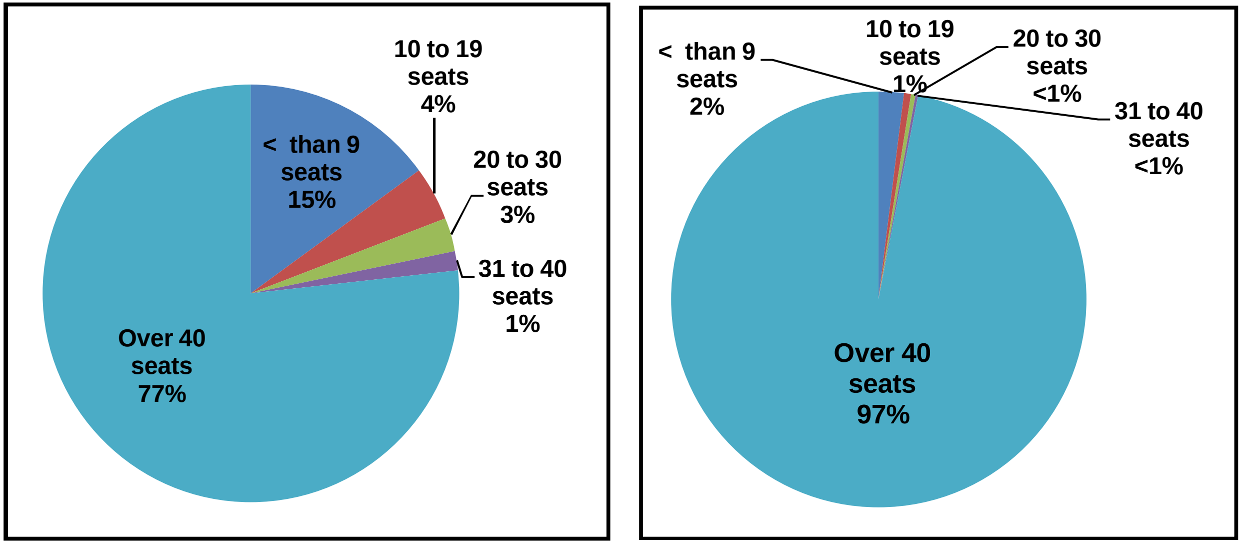
3.2.1.2.2 General Aviation

This section presents an overview related to general aviation activity trends including shipments and sales, and historical and projected fleet mix.

The economic recession that began at the end of 2007 had a marked effect on the general aviation industry. **Exhibit 3.7** presents the historical general aviation aircraft shipments from 2004 to 2014, compared to billings (value of the shipments) for the same time period. According to the General Aviation Manufacturers Association (GAMA), delivery of general aviation aircraft was down nearly 50 percent in 2009 compared to 2008 and was the second year of declining shipments compared to the three previous years, which experienced increases. Since 2009, general aviation aircraft shipments have remained relatively stable.

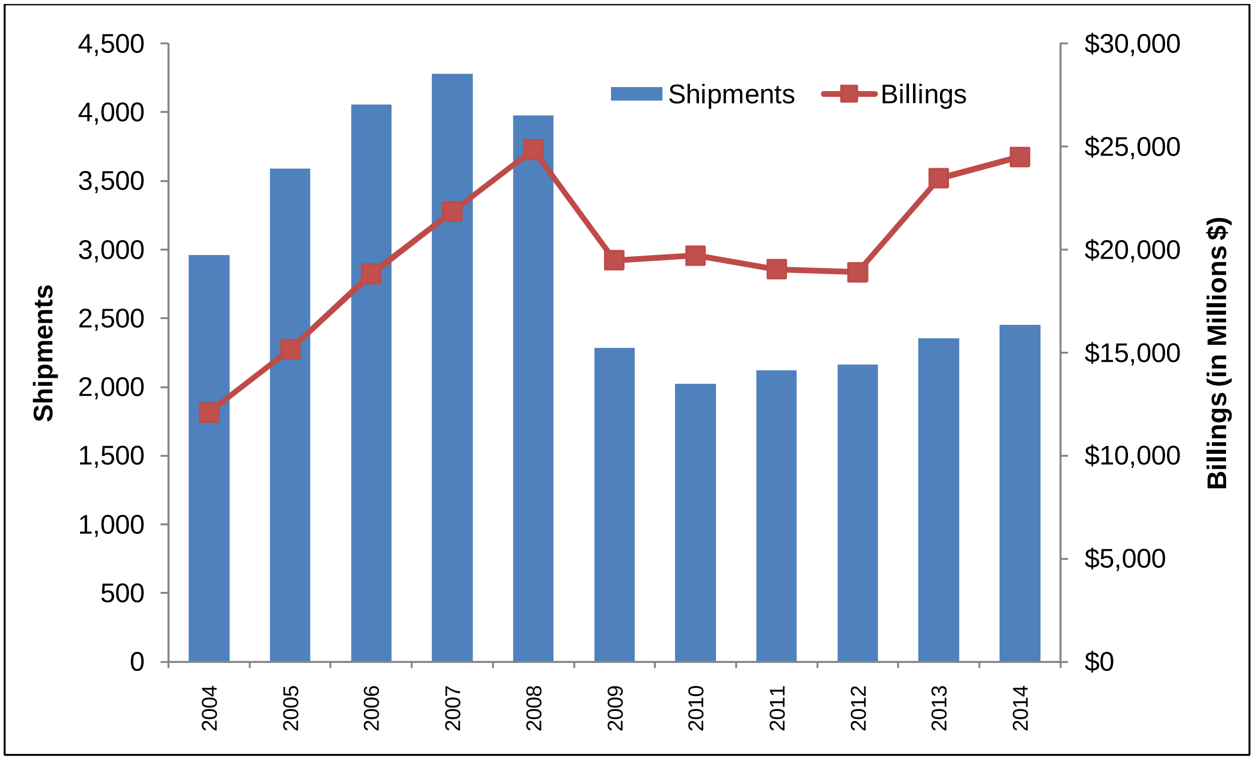
Exhibit 3.6 Comparison of Regional Carriers' Fleet Mix

2014 **2035**



Source: FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

Exhibit 3.7 Historical GA Aircraft Shipments and Billings



Source: GAMA; Compiled by Parsons Brinckerhoff

General aviation aircraft billings also showed increases from 2003 to 2008, but decreased in the wake of the recession in 2009. General aviation billings remained relatively stable at approximately $20 billion from 2009 to 2012. However in 2013 there was an increase of approximately 25 percent over 2012 to $23.4 billion and nearly 5 percent from 2013 to 2014 to $24.5 billion, which is the second highest level of billings on record next to 2008.

The FAA uses the economic forecasts and trends in general aviation aircraft deliveries to develop its forecast of active general aviation aircraft. **Table 3.5** presents the number of historical and FAA projected fixed wing piston and turbine aircraft. As shown in the table, the total number of active fixed wing piston aircraft decreased since 2004, while the number of fixed wing turbine aircraft has increased. From 2004 to 2007, the number of fixed wing piston and fixed wing turbine aircraft fluctuated from approximately 183,000 in 2004 to a high of approximately 187,000 in 2007. Since 2007, the number of piston and turbine aircraft has decreased to approximately 158,000 or approximately 15 percent.

The total number of general aviation aircraft is projected to decline slightly during the projection period decreasing at an average annual rate of 0.1 percent from 2014 to 2035. Fixed wing turbine aircraft are projected to increase at a CAGR of 2.2 percent from 2014 to 2035 compared to an average annual decrease of 0.6 percent for piston aircraft during the same period.

Table 3.6 presents the historical and projected general aviation and military operations at FAA and contract air traffic control towers for the U.S. As shown in the table, the number of combined general aviation and military operations has decreased at an average annual rate of 3.1 percent from 2004 to 2014. Combined general aviation and military operations are projected to increase modestly at 0.3 percent from 2014 to 2015 and followed by consistent increases ranging from 0.4 percent each year from 2015 to 2033, with an average annual growth rate of approximately 0.5 percent from 2013 to 2033. Military operations are projected to remain constant during the projection period, while general aviation operations are projected to increase at an average annual growth rate of 0.4 percent between 2014 and 2035. The modest increases in this type of activity during the projection period are a reflection of the relatively stable level in total fixed wing aircraft during the same period.

Table 3.5 Historical and Projected Fixed Wing Piston and Turbine General Aviation Aircraft

Fiscal Year	Single Engine Piston	Multi Engine Piston	Total Piston	% Change	Turbine	% Change	Total Fixed Wing	% Change
2004	146,613	18,469	165,082		17,677		**182,759**	
2005	148,102	19,504	167,606	1.5%	17,765	0.5%	**185,371**	1.4%
2006	145,036	18,708	163,744	-2.3%	18,442	3.8%	**182,186**	-1.7%
2007	147,569	19,337	166,906	1.9%	19,899	7.9%	**186,805**	2.5%
2008	145,497	17,515	163,012	-2.3%	19,949	0.3%	**182,961**	-2.1%
2009	140,649	16,474	157,123	-3.6%	20,323	1.9%	**177,446**	-3.0%
2010	139,519	15,900	155,419	-1.1%	20,853	2.6%	**176,272**	-0.7%
2011	136,895	15,702	152,597	-1.8%	21,173	1.5%	**173,770**	-1.4%
2012	128,847	14,313	143,160	-6.2%	22,097	4.4%	**165,257**	-4.9%
2013	124,398	13,257	137,655	-3.8%	21,256	-3.8%	**158,911**	-3.8%
2014	123,440	13,215	136,655	-0.7%	21,235	-0.1%	**157,890**	-0.6%
2015	122,435	13,175	135,610	-0.8%	21,305	0.3%	**156,915**	-0.6%
2016	121,440	13,140	134,580	-0.8%	21,435	0.6%	**156,015**	-0.6%
2017	120,490	13,100	133,590	-0.7%	21,620	0.9%	**155,210**	-0.5%
2018	119,530	13,040	132,570	-0.8%	21,835	1.0%	**154,405**	-0.5%
2019	118,605	12,985	131,590	-0.7%	22,100	1.2%	**153,690**	-0.5%
2020	117,770	12,920	130,690	-0.7%	22,430	1.5%	**153,120**	-0.4%
2021	116,965	12,850	129,815	-0.7%	22,800	1.6%	**152,615**	-0.3%
2022	116,180	12,780	128,960	-0.7%	23,235	1.9%	**152,195**	-0.3%
2023	115,410	12,695	128,105	-0.7%	23,710	2.0%	**151,815**	-0.2%
2024	114,645	12,620	127,265	-0.7%	24,265	2.3%	**151,530**	-0.2%
2025	113,905	12,545	126,450	-0.6%	24,855	2.4%	**151,305**	-0.1%
2026	113,190	12,470	125,660	-0.6%	25,520	2.7%	**151,180**	-0.1%
2027	112,500	12,410	124,910	-0.6%	26,250	2.9%	**151,160**	0.0%
2028	111,830	12,340	124,170	-0.6%	27,020	2.9%	**151,190**	0.0%
2029	111,205	12,275	123,480	-0.6%	27,840	3.0%	**151,320**	0.1%
2030	110,635	12,230	122,865	-0.5%	28,720	3.2%	**151,585**	0.2%
2031	110,110	12,185	122,295	-0.5%	29,640	3.2%	**151,935**	0.2%
2032	109,650	12,165	121,815	-0.4%	30,615	3.3%	**152,430**	0.3%
2033	109,260	12,145	121,405	-0.3%	31,630	3.3%	**153,035**	0.4%
2034	108,980	12,135	121,115	-0.2%	32,685	3.3%	**153,800**	0.5%
2035	108,810	12,135	120,945	-0.1%	33,785	3.4%	**154,730**	0.6%
Compounded Annual Growth Rate								
2004-2014	-1.7%	-3.3%	-1.9%		1.9%		**-1.5%**	
2008-2014	-2.7%	-4.6%	-2.9%		1.0%		**-2.4%**	
2014-2020	-0.8%	-0.4%	-0.7%		0.9%		**-0.5%**	
2020-2035	-0.5%	-0.4%	-0.5%		2.8%		**0.1%**	
2014-2035	-0.6%	-0.4%	-0.6%		2.2%		**-0.1%**	

Source: FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

Table 3.6 Historical and Projected U.S. General Aviation and Military Aircraft Operations (in millions)

Fiscal Year	General Aviation	% Change	Military	% Change	Total	% Change
2004	35,524.0		3,009.2		38,533.2	
2005	34,967.7	-1.6%	2,979.3	-1.0%	37,947.0	-1.5%
2006	34,146.8	-2.3%	2,863.6	-3.9%	37,010.4	-2.5%
2007	33,132.0	-3.0%	2,719.5	-5.0%	35,851.5	-3.1%
2008	31,573.8	-4.7%	2,530.6	-6.9%	34,104.4	-4.9%
2009	28,019.0	-11.3%	2,585.5	2.2%	30,604.5	-10.3%
2010	26,580.1	-5.1%	2,606.9	0.8%	29,187.0	-4.6%
2011	25,964.9	-2.3%	2,630.3	0.9%	28,595.3	-2.0%
2012	26,130.0	0.6%	2,578.8	-2.0%	28,708.7	0.4%
2013	25,925.7	-0.8%	2,551.6	-1.1%	28,477.3	-0.8%
2014	25,651.6	-1.1%	2,515.2	-1.4%	28,166.8	-1.1%
2015	25,739.3	0.3%	2,515.2	0.0%	28,254.4	0.3%
2016	25,841.2	0.4%	2,515.1	0.0%	28,356.3	0.4%
2017	25,943.9	0.4%	2,515.1	0.0%	28,459.1	0.4%
2018	26,047.6	0.4%	2,515.1	0.0%	28,562.7	0.4%
2019	26,152.1	0.4%	2,515.1	0.0%	28,667.2	0.4%
2020	26,257.5	0.4%	2,515.1	0.0%	28,772.6	0.4%
2021	26,363.8	0.4%	2,515.1	0.0%	28,878.9	0.4%
2022	26,471.0	0.4%	2,515.1	0.0%	28,986.1	0.4%
2023	26,579.2	0.4%	2,515.1	0.0%	29,094.2	0.4%
2024	26,688.2	0.4%	2,515.0	0.0%	29,203.3	0.4%
2025	26,798.2	0.4%	2,515.0	0.0%	29,313.3	0.4%
2026	26,909.2	0.4%	2,515.0	0.0%	29,424.2	0.4%
2027	27,021.2	0.4%	2,515.0	0.0%	29,536.2	0.4%
2028	27,134.1	0.4%	2,515.0	0.0%	29,649.1	0.4%
2029	27,248.0	0.4%	2,515.0	0.0%	29,763.0	0.4%
2030	27,363.0	0.4%	2,515.0	0.0%	29,877.9	0.4%
2031	27,478.9	0.4%	2,515.0	0.0%	29,993.9	0.4%
2032	27,595.9	0.4%	2,515.0	0.0%	30,110.9	0.4%
2033	27,713.9	0.4%	2,515.0	0.0%	30,228.9	0.4%
2034	27,833.0	0.4%	2,514.9	0.0%	30,348.0	0.4%
2035	27,953.2	0.4%	2,514.9	0.0%	30,468.2	0.4%
Compounded Annual Growth Rates						
2004-2014	-3.2%		-1.8%		-3.1%	
2008-2014	-3.4%		-0.1%		-3.1%	
2014-2020	0.4%		0.0%		0.4%	
2020-2035	0.4%		0.0%		0.4%	
2014-2035	0.4%		0.0%		0.4%	

Source: FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

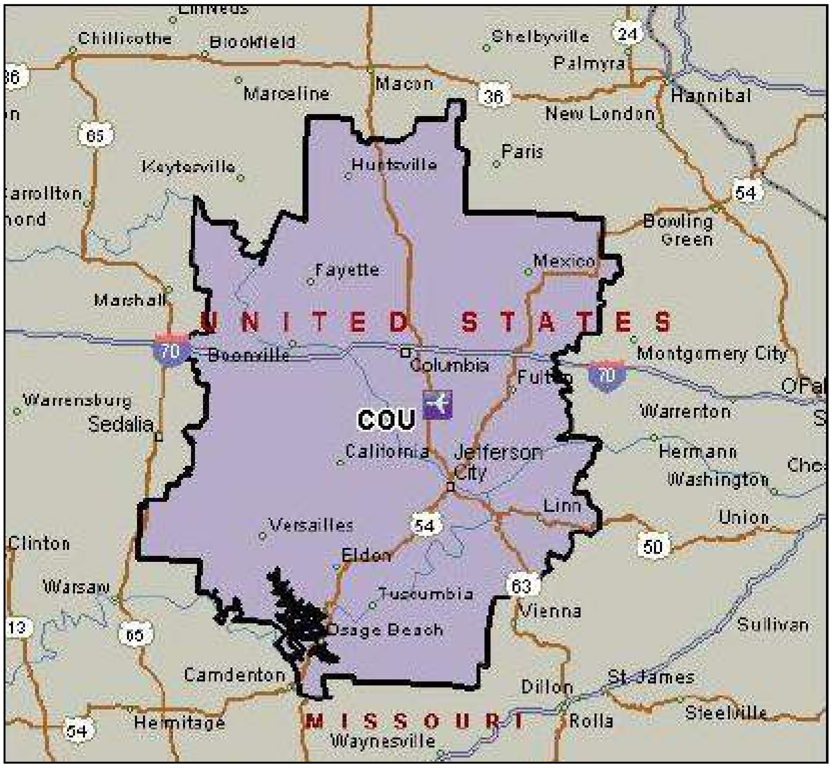
3.2.2 Airport Service Region and Passenger Demand Analysis

In 2012, a Passenger Demand Analysis was performed for Columbia Regional Airport. The analysis developed information on the travel patterns of local airline passengers who reside in the COU geographic area. The analysis examined:

- The originating airports used by air travelers
- Diversion of airline passenger traffic to competing airports
- An estimate of total airline passengers in the catchment area (service region) and related destinations
- Airlines used by local air travelers
- Average airfares
- Service levels at COU and competing airports
- An assessment of the air service situation at COU

The Airport's service region (or catchment area) as identified in the 2012 Passenger Demand Analysis contains the population of travelers who should use COU considering the drive time from the service region to competing airports such as STL, MCI, and Springfield-Branson National Airport (SGF). In 2012, the estimated population of the service region, shown in **Exhibit 3.8**, was 478,815[2].

Exhibit 3.8 COU Service Region



Source: COU Passenger Demand Analysis – CY 2011, Exhibit 3.1

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[2] Columbia Regional Airport, Passenger Demand Analysis – CY 2011, Mead & Hunt, July 12, 2012.

Key findings of the 2012 Passenger Demand Analysis include the following:

- COU's total air service market was estimated at 716,377 annual origin and destination passengers or 981 passengers daily each way.
- 11 percent of service region travelers used COU. 55 percent diverted to STL, 33 percent to MCI, and 1 percent to SGF.
- From CY 2002 through 2011, domestic origin and destination passengers (as reported by airlines to USDOT) changed as follows:
  - COU passengers increased at a 4.6 percent average annual rate
  - STL and MCI passengers remained flat
  - SGF passengers increased at a 1.2 percent average annual rate
- COU and its surrounding catchment area have demonstrated the ability to support additional hub service with Denver, Chicago O'Hare, and Dallas-Ft. Worth as the top priorities. In addition, service by Allegiant to Orlando is also an opportunity with the future possibility of Las Vegas and/or Tampa service.

Since the completion of the 2012 Passenger Demand Analysis, nonstop service was initiated to ORD and DFW and as shown in Exhibit 3.12, average load factors for these flights remain high even as American Airlines transitioned to larger aircraft in January 2015.

3.2.3 Local Economic and Aviation Trends

The following sections present the trends in socioeconomic variables for the COU Service Region as described previously and aviation demand for COU. The socioeconomic data compared includes population, employment and production value data. The aviation data includes enplanements and aircraft operations, as well as comparisons of COU traffic to that of the combined traffic for COU, MCI, and STL, as well as the FAA Central Region, and the nation.

3.2.3.1 Local Socioeconomic Trends

In developing future aviation demand it is important to compare the socioeconomic trends of the COU Service Region compared to the State of Missouri, and the United States to determine what strengths lie in the area and if there is any correlation with this data and aviation demand. This section compares population growth, employment, and gross domestic product. Data was obtained from both local and national sources. In some cases, the entire COU Service Region was not available; however, data was obtained for the two metropolitan statistical areas within the COU Service Region (Columbia, Missouri MSA and the Jefferson City, Missouri MSA)

3.2.3.1.1 Population

Table 3.7 presents the historical and projected population for the counties contained in the COU Service Region and the State of Missouri. As shown, the CAGR for population in the COU Service Region is greater than that for the State of Missouri. In addition, it is projected that the COU Service Region's share of the state's population is expected to increase in the future.

Table 3.7 COU Service Region and Missouri Population

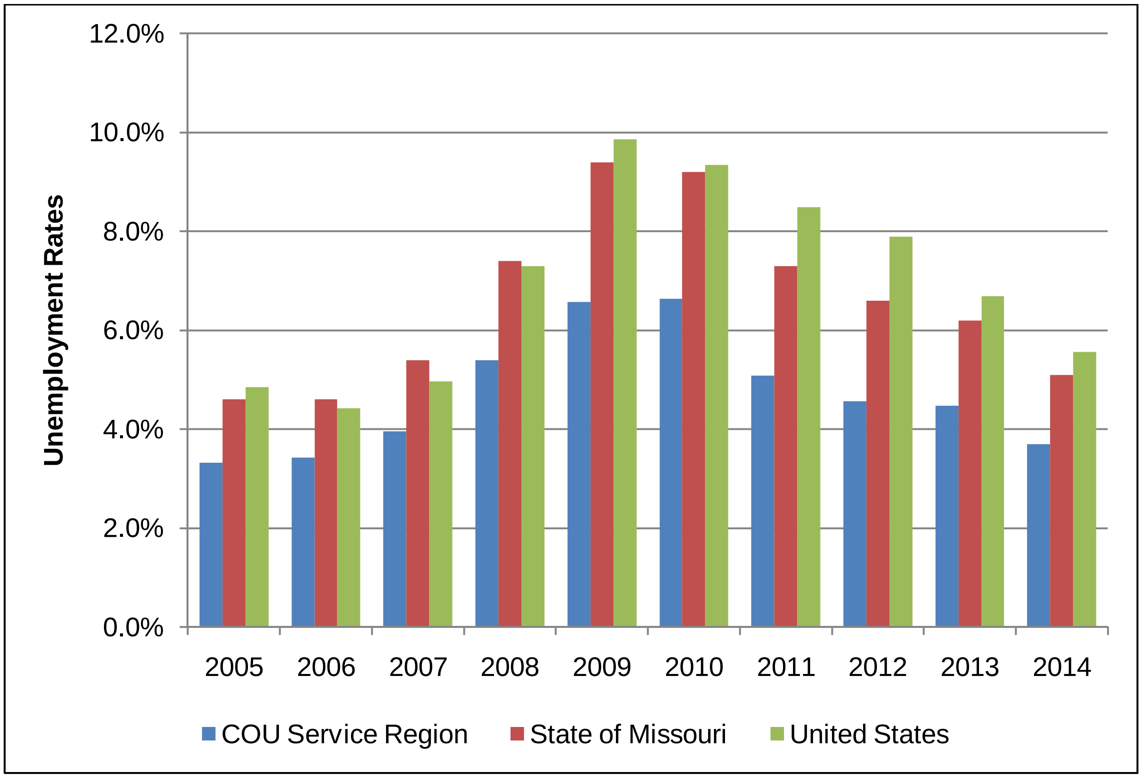
Geography	HISTORICAL			PROJECTED			
	2000	2005	2010	2015	2020	2025	2030
COU Service Region County							
Audrain	25,853	25,810	25,806	25,966	26,217	26,564	27,027
Boone	135,454	145,758	158,353	170,796	183,101	194,516	204,264
Callaway	40,766	42,384	44,817	47,427	50,140	52,751	55,096
Cole	71,397	72,398	74,620	76,979	79,333	81,571	83,583
Cooper	16,670	17,164	17,933	18,760	19,583	20,337	20,979
Howard	10,212	9,961	9,887	9,933	10,050	10,186	10,307
Maries	8,903	9,001	9,275	9,563	9,848	10,129	10,406
Miller	23,564	24,596	25,550	26,464	27,277	27,928	28,404
Moniteau	14,827	15,030	15,217	15,490	15,844	16,226	16,638
Morgan	19,309	20,354	21,386	22,394	23,357	24,183	24,827
Osage	13,062	13,237	13,280	13,379	13,493	13,608	13,704
Pulaski	41,165	43,951	44,466	44,989	45,497	46,003	46,520
Total COU Service Region	**421,182**	**439,644**	**460,590**	**482,140**	**503,740**	**524,002**	**541,755**
CAGR		0.9%	0.9%	0.9%	0.9%	0.8%	0.7%
State of Missouri	**5,596,687**	**5,781,293**	**5,979,344**	**6,184,390**	**6,389,850**	**6,580,868**	**6,746,762**
CAGR		0.7%	0.7%	0.7%	0.7%	0.6%	0.5%
COU Service Region % of State	7.5%	7.6%	7.7%	7.8%	7.9%	8.0%	8.0%

Source: Missouri Department of Economic Development, Missouri Economic Research and Information Center; Compiled by Parsons Brinckerhoff

3.2.3.1.2 Employment

Exhibit 3.9 presents a comparison of the unemployment rate for the COU Service Region (combined metropolitan statistical areas for Columbia, Missouri and Jefferson City, Missouri), the state of Missouri and the United States. As shown, the unemployment rate for the COU Service Region has consistently been lower than the State of Missouri and the United States from 2005 to 2014. The unemployment rate for the COU Service Region was on average 28 percent and 30 percent lower than that of the State of Missouri and the nation, respectively, during the time period presented.

Exhibit 3.9 Unemployment Rate Comparison

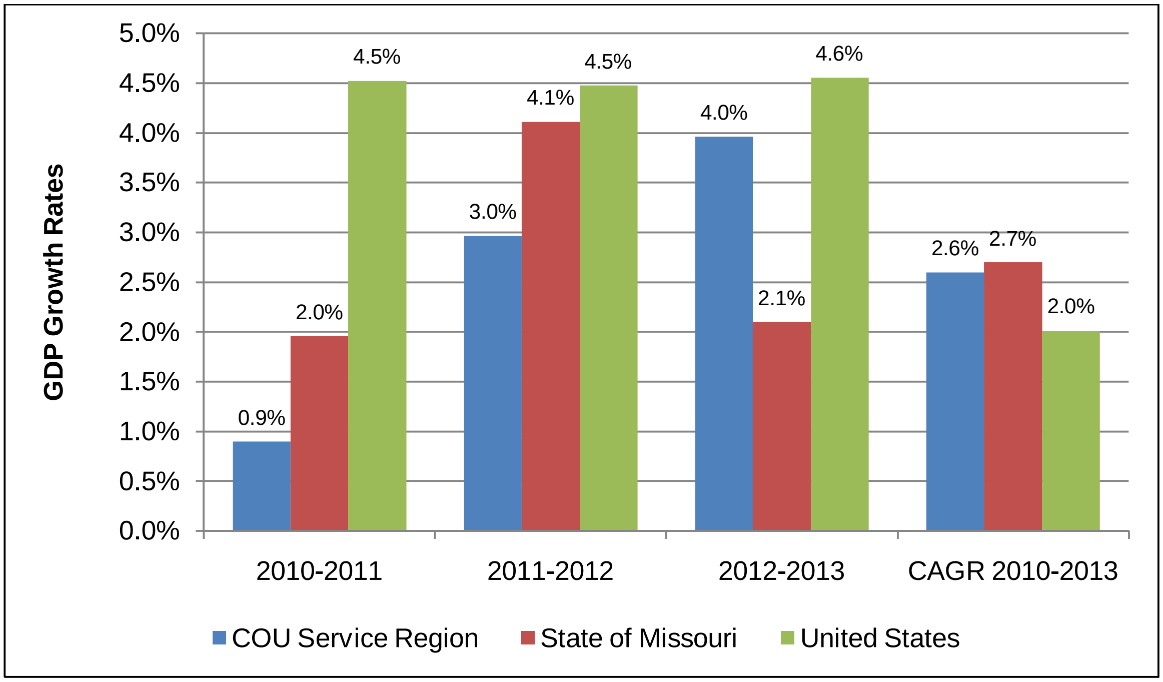


Source: U.S. Bureau of Labor Statistics; Compiled by Parsons Brinckerhoff

3.2.3.1.3 Gross Domestic Product

Exhibit 3.10 presents a comparison of the GDP for the COU Service Region (combined metropolitan statistical areas for Columbia, Missouri and Jefferson City, Missouri), the total for metropolitan areas of the State of Missouri and the United States. As shown, the year-over-year growth rates in GDP for the COU Service Region were consistently lower than the United States from 2010 to 2013. The COU Service Region's growth rate was lower than the State of Missouri from 2010 to 2012, but higher from 2012 to 2013. GDP's CAGR was higher for the COU Service Region and the State of Missouri than the United States during the period.

Exhibit 3.10 Gross Domestic Product



Source: Missouri Department of Economic Development, Missouri Economic Research and Information Center (COU Service Region and Missouri); FAA Aerospace Forecast (United States); Compiled by Parsons Brinckerhoff.

3.2.3.2 Commercial Aviation

Table 3.8 presents the historical enplanement activity[3] at COU compared to the combined activity of COU, Kansas City International Airport (MCI), and Lambert-St. Louis International Airport (STL), as well as U.S. regional carriers and system wide from 2004 to 2014. As shown in the table, COU's enplanement levels are estimated at approximately 56,000 in 2014, the highest level in the period. Since 2008, the enplanement levels at COU have increased at a CAGR of 28.1 percent.

As shown, COU's share of combined enplanements of COU, MCI, and STL increased from 0.09 percent in 2008 to 0.51 percent in 2014. This is an indication that passengers in COU's Service Region are utilizing the air service provided at COU rather than driving to either MCI or STL. While some enplanement growth can be attributed to socioeconomic factors, much of the growth is likely due to the availability of better air service. COU's share of both U.S. regional carriers and system wide also increased during the same time period.

Table 3.9 presents the historical commercial aircraft operations at COU from 2004 to 2014. Commercial aircraft operations were approximately 3,000 between 2011 and 2013, with minor fluctuations resulting from the suspension and initiation of service by different air carriers and approximately 3,500 in 2014. Currently, COU is served by American Airlines, providing twice daily service to and from both ORD and DFW. These four daily flights equate to approximately 3,000 annual aircraft operations, with the remaining commercial aircraft operations being chartered flights.

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[3] COU, MCI, and STL data is presented in calendar year format, while the FAA Aerospace Forecast is presented in terms of the Federal fiscal year.

Table 3.8 Historical Enplanements (COU, Regional, and National)

Year	COU[1]	% Change	COU+MCI+STL	% Change	COU Market Share	FAA Central Region (millions)	% Change	COU Market Share	US System (millions)	% Change	COU Market Share
2004	20,268		11,684,935		0.1735%	129.1		0.0157%	641.2		0.0032%
2005	22,005	8.6%	11,817,657	1.1%	0.1862%	149.7	16.0%	0.0147%	689.0	7.5%	0.0032%
2006	15,809	-28.2%	12,398,498	4.9%	0.1275%	155.7	4.0%	0.0102%	737.0	7.0%	0.0021%
2007	11,516	-27.2%	12,876,838	3.9%	0.0894%	159.7	2.6%	0.0072%	763.8	3.6%	0.0015%
2008	12,719	10.4%	12,437,877	-3.4%	0.1023%	162.6	1.8%	0.0078%	759.1	-0.6%	0.0017%
2009	26,842	111.0%	11,032,779	-11.3%	0.2433%	156.6	-3.7%	0.0171%	704.4	-7.2%	0.0038%
2010	38,293	42.7%	10,949,326	-0.8%	0.3497%	164.4	5.0%	0.0233%	712.1	1.1%	0.0054%
2011	40,990	7.0%	11,182,201	2.1%	0.3666%	164.1	-0.2%	0.0250%	731.1	2.7%	0.0056%
2012	41,573	1.4%	11,168,400	-0.1%	0.3722%	162.1	-1.2%	0.0256%	736.7	0.8%	0.0056%
2013	45,741	10.0%	11,084,795	-0.7%	0.4126%	158.4	-2.3%	0.0289%	739.5	0.4%	0.0062%
2014 [1]	56,080	22.6%	11,051,903	-0.3%	0.5074%	158.1	-0.2%	0.0355%	756.3	2.3%	0.0074%
Compounded Annual Growth Rate											
2004-2008	-11.0%		1.6%			5.9%			4.3%		
2008-2014	28.1%		-1.9%			-0.5%			-0.1%		
2004-2014	10.7%		-0.6%			2.0%			1.7%		

Note:

1. COU enplanements for 2014 are estimated by combining actual commercial carrier enplanements with an estimate for charter activity.

Sources: Airport Management; FAA Terminal Area Forecast; FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

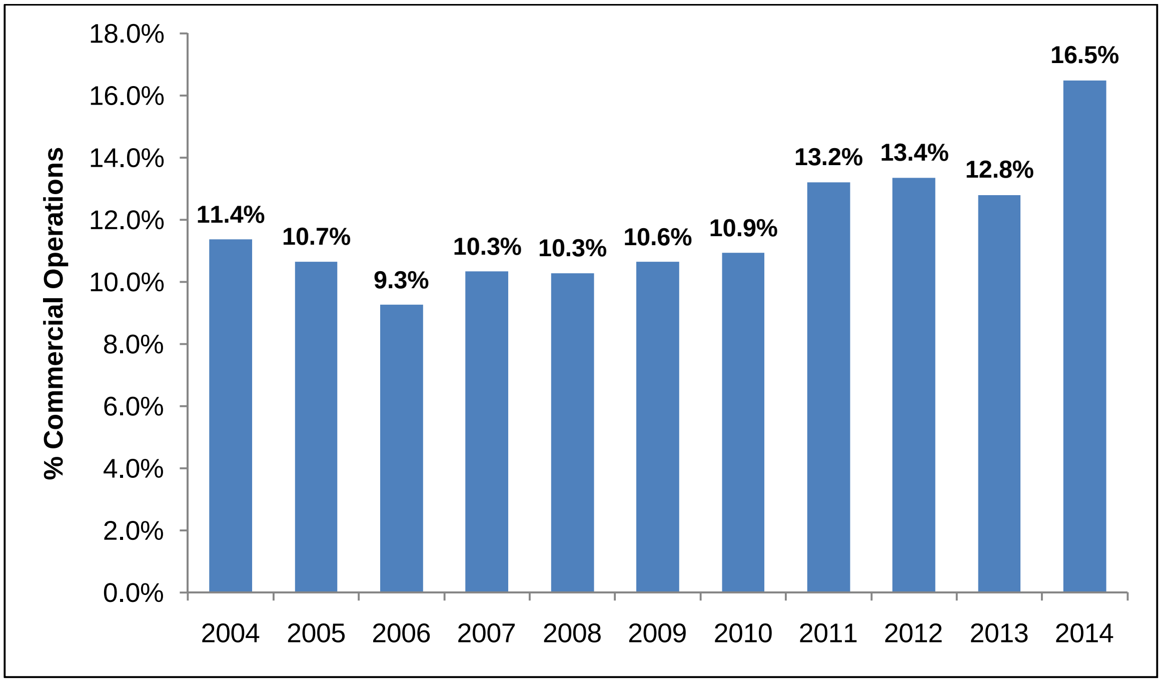
Table 3.9 Historical COU Commercial Aircraft Operations

Year	Air Carrier	Air Taxi & Commuter	Total Commercial Operations	% Change
2004	153	3,570	3,723	
2005	160	3,242	3,402	-8.6%
2006	137	2,873	3,010	-11.5%
2007	185	2,891	3,076	2.2%
2008	141	2,421	2,562	-16.7%
2009	121	2,586	2,707	5.7%
2010	69	2,667	2,736	1.1%
2011	68	3,111	3,179	16.2%
2012	84	3,240	3,324	4.6%
2013	187	2,617	2,804	-15.6%
2014	73	3,380	3,453	23.1%
Compounded Annual Growth Rate				
2004-2008	-2.0%	-9.3%	-8.9%	
2008-2014	-10.4%	5.7%	5.1%	
2004-2014	-7.1%	-0.5%	-0.8%	

Sources: FAA Terminal Area Forecast (2004-2013); Air Traffic Control Tower Data (2014); Compiled by Parsons Brinckerhoff

Exhibit 3.11 presents the commercial share of total aircraft operations at COU from 2004 to 2014. As shown, commercial operations have ranged from 9.3 percent of total aircraft operations in 2006 to 16.5 percent in 2014. In recent years, commercial operations have increased due to COU consistently having one or more air carriers provide commercial service.

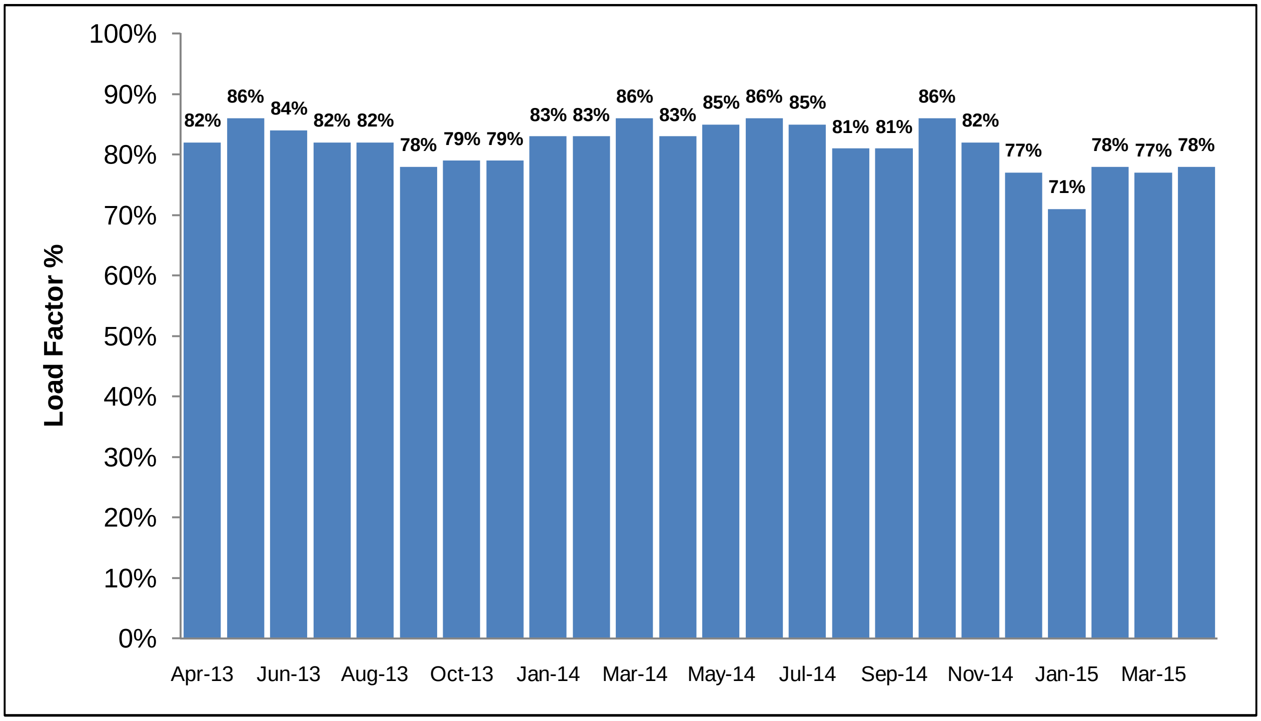
Exhibit 3.11 COU Commercial Share of Total Aircraft Operations



Sources: FAA Terminal Area Forecast (2004-2013); Air Traffic Control Tower Data (2014); Compiled by Parsons Brinckerhoff

Exhibit 3.12 presents monthly load factors from April 2013 through April 2015 for service that was initiated by American Airlines in February 2013. As shown, the average load factor was between 82 percent and 86 percent for 2013 and 2014, slightly higher than the national average for regional carriers of 78-80 percent. In 2015, the average load factor has decreased somewhat to be approximately 78 percent. This is due to American Airlines increasing the size of aircraft from a CRJ 200 to a CRJ 700, providing an additional 15 seats per departure or approximately 2,000 additional available departing seats monthly in the market. If passenger traffic had not increased with these additional flights, the average load factor would have decreased to 60 percent, which is 25 percent less than the load factor observed prior to the addition of the flight. This indicates that previously unmet demand in the COU Service Region is utilizing the additional service provided by American Airlines.

Exhibit 3.12 COU Average Monthly Load Factor



Source*:* Airport Management; Compiled by Parsons Brinckerhoff

3.2.3.3 General Aviation and Military

Table 3.10 presents historical general aviation and military aircraft operations at COU. As shown in the table, total general aviation and military aircraft operations have decreased at an average annual rate of 4.9 percent from 2004 to 2014. In recent years (2008 to 2014), the average annual rate of decrease was 4.0 percent. Since 2004, the share of military aircraft operations has averaged approximately 7 percent, with the level of military operations decreasing from 2004 to 2014 at an average annual rate of 0.4 percent. This overall share of military aircraft operations is slightly lower than the U.S. as whole where military aircraft operations only make up approximately 9 percent of total general aviation and military aircraft operations combined.

Table 3.10 Historical COU General Aviation and Military Aircraft Operations

Year	Itinerant			Local			Total Operations			% Change
	GA	Military	Total	GA	Military	Total	GA	Military	Total	
2004	19,487	658	20,145	7,892	984	8,876	27,379	1,642	29,021	
2005	19,194	688	19,882	7,447	1,167	8,614	26,641	1,855	28,496	-1.8%
2006	19,712	617	20,329	8,152	1,002	9,154	27,864	1,619	29,483	3.5%
2007	18,669	600	19,269	6,799	611	7,410	25,468	1,211	26,679	-9.5%
2008	14,965	515	15,480	6,229	618	6,847	21,194	1,133	22,327	-16.3%
2009	14,239	654	14,893	6,418	1,404	7,822	20,657	2,058	22,715	1.7%
2010	12,978	609	13,587	6,935	1,751	8,686	19,913	2,360	22,273	-1.9%
2011	13,487	626	14,113	6,156	615	6,771	19,643	1,241	20,884	-6.2%
2012	13,464	771	14,235	6,602	707	7,309	20,066	1,478	21,544	3.2%
2013	11,949	514	12,463	6,118	517	6,635	18,067	1,031	19,098	-11.4%
2014	10,774	582	11,356	5,139	990	6,129	15,913	1,572	17,485	-8.4%
Compounded Annual Growth Rate										
2004-2008			-6.4%			-6.3%	-6.2%	-8.9%	-6.3%	
2008-2014			-5.0%			-1.8%	-4.7%	5.6%	-4.0%	
2004-2014			-5.6%			-3.6%	-5.3%	-0.4%	-4.9%	

Source: FAA Terminal Area Forecast (2004-2013); Air Traffic Control Tower Data (2014); Compiled by Parsons Brinckerhoff

Because general aviation activity is the one element of non-commercial operations that are forecast to increase for the nation, comparisons of COU's historical general aviation activity, combined local and itinerant, were developed for both the FAA Central Region and the nation to identify any correlating trends. **Table 3.11** presents this analysis. As shown, COU's share of FAA Central Region general aviation aircraft operations has decreased between 2004 and 2014 and has decreased at an average annual rate that is nearly five times that of the FAA Central Region since 2008. COU's share of the nation's general aviation operations has remained relatively consistent since 2004.

Exhibit 3.13 presents the shares of local and itinerant non-commercial aircraft operations at COU from 2004 to 2014. As shown, the share of local aircraft operations has ranged from approximately 30 percent in 2004 and 2005 to nearly 40 percent in 2010. While general aviation activity has decreased overall during this time frame, the split between local and itinerant aircraft operations has remained relatively consistent.

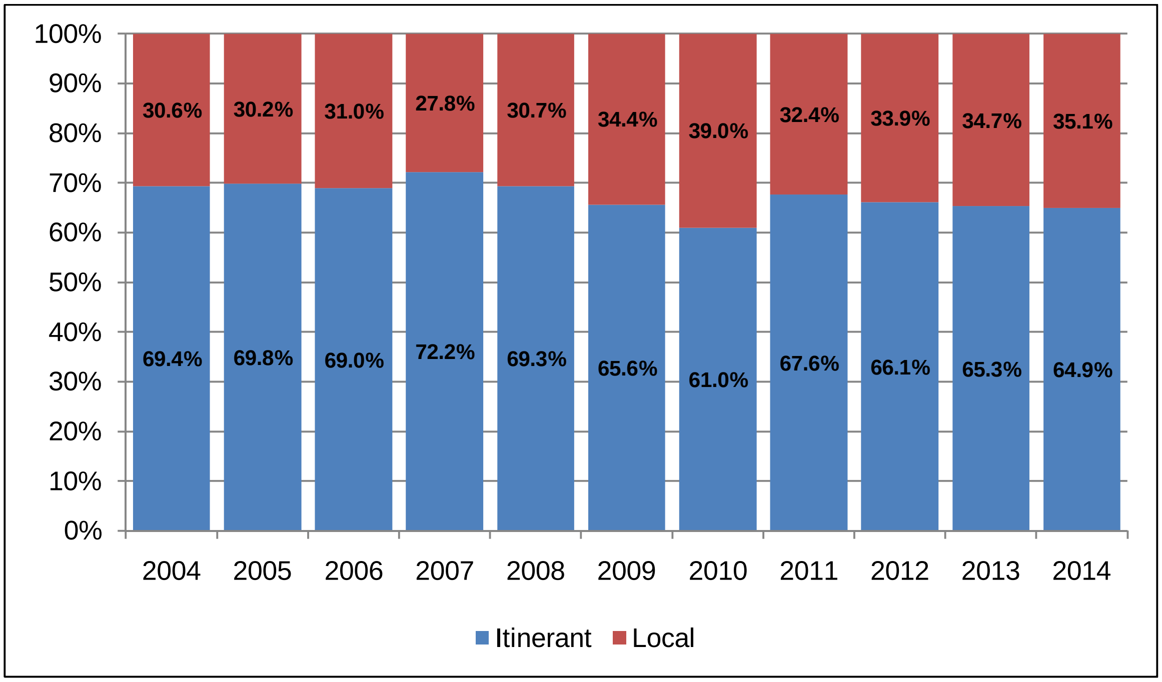
Table 3.12 presents a comparison of the historical based aircraft fleet mix for 2007 and 2014 at COU. As shown, since 2007 there have been shifts in the based aircraft fleet mix at COU and in the U.S. At COU, there has been a decrease from 47 to 34 based aircraft from 2007 to 2014. In addition, the distribution of multi engine aircraft and rotorcraft has declined while the distribution of single engine and jet aircraft has increased. This is inconsistent with the trend for the U.S. during the same time period. In addition, the number of based aircraft has decreased nearly 28 percent at COU from 2007 to 2014, compared to approximately 15 percent for the nation during the same time period.

Table 3.11 Historical COU General Aviation Aircraft Operations Comparisons

Year	COU GA Ops	% Change	FAA Central Region (in 000s)	% Change	US System (in 000s)	% Change	COU Market Share	
							Central Region	US System
2004	27,379		3,257.5		35,524.0		0.84%	0.077%
2005	26,641	-2.7%	3,291.1	1.0%	34,967.7	-1.6%	0.81%	0.076%
2006	27,864	4.6%	3,263.5	-0.8%	34,146.8	-2.3%	0.85%	0.082%
2007	25,468	-8.6%	3,226.1	-1.1%	33,132.0	-3.0%	0.79%	0.077%
2008	21,194	-16.8%	3,978.6	23.3%	31,573.8	-4.7%	0.53%	0.067%
2009	20,657	-2.5%	3,814.4	-4.1%	28,019.0	-11.3%	0.54%	0.074%
2010	19,913	-3.6%	3,735.0	-2.1%	26,580.1	-5.1%	0.53%	0.075%
2011	19,643	-1.4%	3,756.3	0.6%	25,964.9	-2.3%	0.52%	0.076%
2012	20,066	2.2%	3,798.9	1.1%	26,130.0	0.6%	0.53%	0.077%
2013	18,067	-10.0%	3,755.6	-1.1%	25,925.7	-0.8%	0.48%	0.070%
2014	15,913	-11.9%	3,722.0	-0.9%	25,651.6	-1.1%	0.43%	0.062%
Compounded Annual Growth Rates								
2004-2008	-6.2%		5.1%		-2.9%			
2008-2014	-4.7%		-1.1%		-3.4%			
2004-2014	-5.3%		1.3%		-3.2%			

Source: FAA Terminal Area Forecast; FAA Aerospace Forecast (FY 2015-2035); Compiled by Parsons Brinckerhoff

Exhibit 3.13 Itinerant vs. Local Aircraft Operations



Source: FAA Terminal Area Forecast; Compiled by Parsons Brinckerhoff

Table 3.12 Historical COU Based Aircraft Fleet Mix

Aircraft Type	2007				2014			
	COU	% Dist.	U.S.	% Dist.	COU	% Dist.	U.S.	% Dist.
Single Engine	21	44.7%	147,569	75.1%	17	50.0%	123,440	73.5%
Multi Engine	15	31.9%	19,337	9.8%	9	26.5%	13,215	7.9%
Jet	10	21.3%	19,899	10.1%	8	23.5%	21,235	12.6%
Rotorcraft	1	2.1%	9,567	4.9%	0	0.0%	10,085	6.0%
Total	47	100.0%	196,372	100.0%	34	100.0%	167,975	100.0%

Source: FAA Aerospace Forecast (FY 2015-2035); COU 2009 Master Plan; Compiled by Parsons Brinckerhoff

3.3 Base Case Forecast

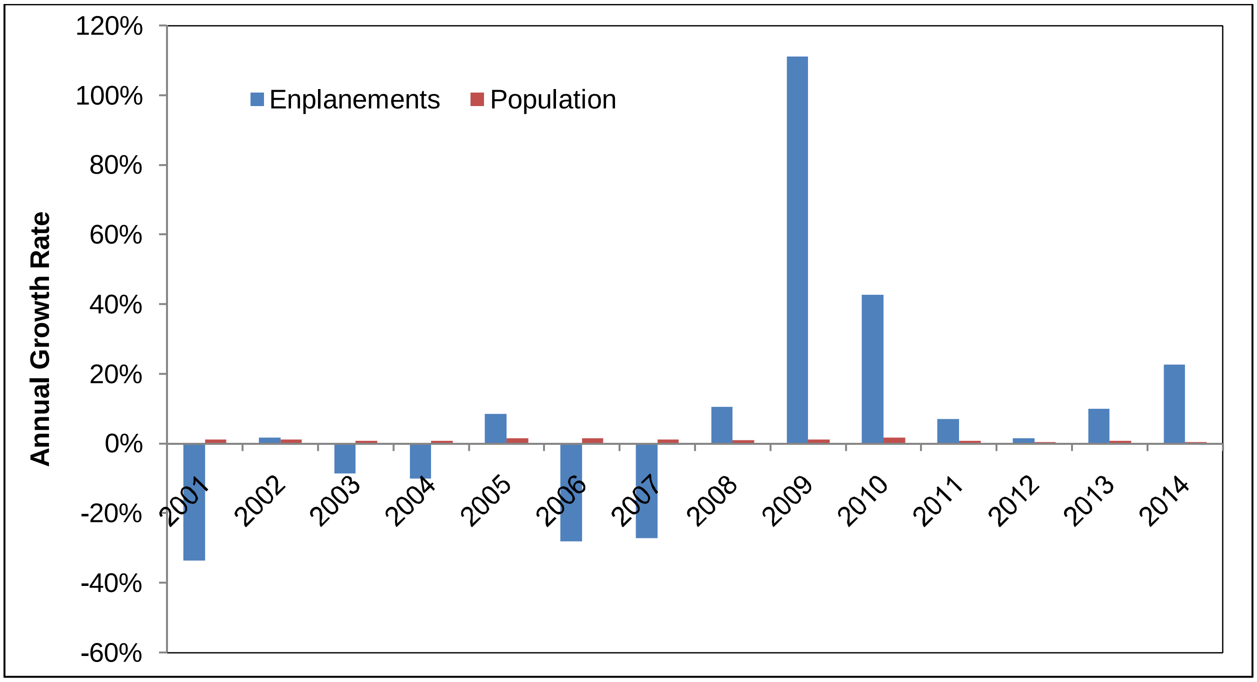
In an effort to quantify the anticipated level of aircraft activity for COU, a base case forecast was developed for the 20-year planning period (2014 to 2035). The base case forecast will be reviewed by the FAA for consistency with the TAF and use for the remainder of the Terminal Area Master Plan. In addition to the base case, two additional forecast scenarios (a low case forecast and a high case forecast) will be developed later in this chapter for use in planning for potential variations in service in the future. The base case forecast includes projections for enplanements, aircraft operations, and based aircraft at COU.

The typical methodology used for developing an aviation demand forecast is statistical regression analyses. For a statistical regression analysis to be meaningful, identification of a variable that positively correlates to variable being forecast needs to be identified, as well as have a long history of data that has a shows a consistent trend. While COU has had commercial service in the past, it has only been recently (2008 to 2014) that the airport has seen consistent growth. As shown in Exhibit 3.1 enplanements were on a decreasing trend, but in 2008 began to increase at rates that were greater than that of the nation and the region.

Regression analyses are based on factors such as population and/or income, as these factors can determine the propensity of a traveler to utilize air travel versus other modes of transportation. Regression analyses were developed for both population and per capita income of the COU region and enplanements. The correlation coefficient (the degree of predictability that changes in one variable predict the changes in another variable) for these analyses was approximately 0.5 for population and 0.7 for income. While the correlation for both was positive, the values were not close enough to 1.0 to provide a strong enough relationship to use future projections of either of them to predict future enplanements.

In the case of COU, enplanements have fluctuated at rates that are far different from that of the population of the COU Service Region. The CAGR for enplanements from 2000 to 2014 was approximately 4 percent compared to approximately 1 percent for population during the same time period. More recently, from 2008 to 2014, enplanements have increased at a CAGR of nearly 30 percent, while population has increased at a CAGR of 1 percent during the same time period. **Exhibit 3.14** below graphically presents a comparison of population for the largest portion of the COU Service Region compared to enplanement growth.

Exhibit 3.14 Comparison of COU Enplanement Growth to Catchment Area Population Growth



Sources: Airport Management; Compiled by Parsons Brinckerhoff

Because no positively correlated variable could be identified for aviation demand, the primary methodology used to prepare this forecast was a review of historical growth rates in aviation activity and a comparison of COU's share of historical aviation activity to the activity of the nation, FAA Central Region, and local airports during the same time period.

Assumptions regarding activity growth were applied and the FAA aviation demand forecasts were then used to derive the COU forecast. Given the recent changes in air service levels and passenger growth at COU, historical trend and/or regression analysis was not deemed statistically meaningful and appropriate for use in projecting aviation activity.

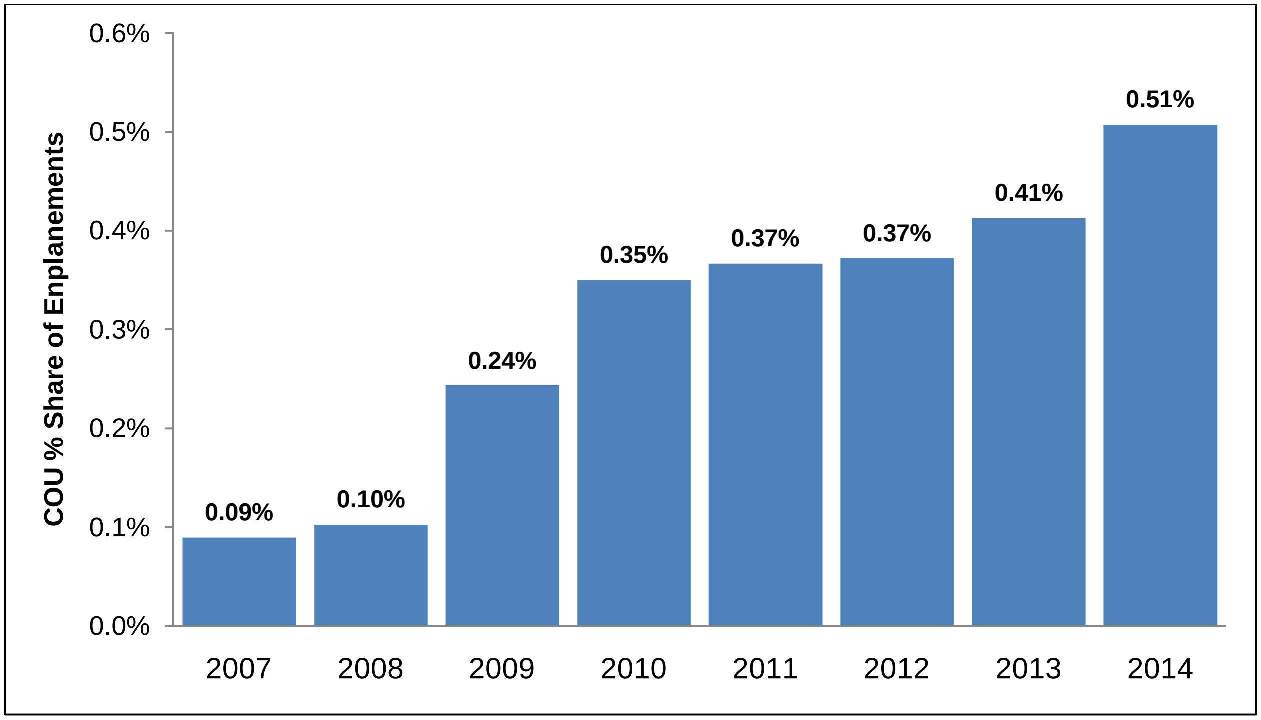
The following sub-sections provide additional details regarding the various components of the aviation activity forecasts.

3.3.1 Commercial Aviation Activity

The primary assumptions related to the development of the commercial aviation forecast are as follows:

- COU's share of enplanements compared to the combined enplanements of COU, MCI, and STL will continue to increase in a pattern similar to the last five years for the first five years of the forecast period. Thereafter, the share will remain the same and enplanements will increase at the same rate projected in the Terminal Area Forecast for MCI and STL. **Exhibit 3.15** below graphically presents COU's share of the combined enplanements for COU, MCI, and STL. As shown, COU's share has increased from 0.09 percent to 0.51 percent, averaging 0.31 percent. The average annual increase in the COU's share of the combined enplanements of COU, STL, and MCI was approximately 0.004 percent per year.

Exhibit 3.15 COU Share of Combined COU, MCI, and STL Enplanements



Sources*:* Airport Management; Terminal Area Forecast; Compiled by Parsons Brinckerhoff

The projected increase in COU's share of enplanements was determined to be reasonable not only based on historical trends, but using other airports with similar traffic characteristics as benchmarks. The benchmarks were chosen specifically for certain similarities to COU. They are all located in an area with at least one university and are also in reasonable proximity to another airport with commercial service. Because of the dynamic of having an educational institution within an airport's market area, the socioeconomic characteristics of the passengers utilizing the smaller airport would be similar for both the faculty who are reported in the population statistics and students, who are not typically permanent residents of the market area and excluded from population statistics. In addition, each of these airports has commercial service provided by a regional carrier to a major airline hub, providing one-stop service to a number of locations. **Table 3.13** provides a summary of the benchmarked airports.

As shown in the table, the enplanement to population ratio ranges from 0.26 (COU) to 1.03 (South Bend). This provides another way in which to check the enplanement forecast using the share of the region methodology described above in the absence of regression analysis. Applying COU's current day enplanement to population ratio to the population projections for 2030 presented in Table 3.7 would result in enplanements of approximately 53,000 (using only the Columbia, MO MSA population) to 141,000 (using the population of the entire catchment area). However, if the enplanement to population ratio one of the other airports is applied to the population projections, enplanements could increase significantly. For example, using the median (approximately 0.66) would result in enplanements for COU in 2030 ranging from approximately 135,000 to 355,000, using the COU MSA population or the COU catchment area population, respectively.

Table 3.13 Comparison of Airport Benchmarks

Airport	University	Nearby Commercial Service Airport	Airport Proximity	2013 Enplanements	2013 Population	Enplanements/ Population
Columbia Regional	University of Missouri	MCI STL	2.5 hrs 2 hrs	44,798	170,929	0.26
Central Illinois Regional (IL)	Illinois State University	Chicago, IL	2 hrs	208,444	191,294	0.35
Manhattan Regional (KS)	Kansas State University	MCI Wichita, KS	2 hrs (both)	64,186	98,575	0.65
Central Nebraska Regional (NE)	Grand Island College Central Community College	Omaha, NE	2.5 hrs	56,650	84,755	0.66
University Park (PA)	Pennsylvania State University	Harrisburg, PA	2 hrs	131,125	157,847	0.83
South Bend International	University of Notre Dame	Chicago, IL	2 hrs	328,383	318,532	1.03
Median						**0.66**
Average						**0.70**

Source: U.S. Bureau of the Census (Population); FAA TAF (Enplanements); Individual airport websites; Compiled by Parsons Brinckerhoff

- Currently, COU is served by American Airlines utilizing 65-seat CRJ 700 aircraft. As passengers increase in the first five years of the forecast period, it is likely that frequencies will be added as the average load factor increases. In the latter part of the forecast period frequencies to airline hubs that are farther away from COU may warrant the use of larger regional jet aircraft with either approximately 80 seats or 95 seats. Additionally, it is possible that an air carrier, such as Allegiant, may provide direct service to tourist markets with several flights during the week. Allegiant currently serves some of the benchmarked airports such as Central Nebraska Regional and Central Illinois Regional. This type of service is typically scheduled, but not with regular daily service.

- The number of commercial service aircraft departures is projected to increase as passengers grow in the short-term forecast period. Average load factors were approximately 75 percent for the COU market in the first four months of 2015, a decrease from prior months (approximately 85 percent) with the changing of service from 50 seat aircraft to 65 seat aircraft. As load factors increase with the growth in passengers additional frequencies will be added in the short term to the airline hubs currently served at COU (ORD and DFW) or new daily service will be added to another hub such as Charlotte, Houston or Atlanta. Eventually, larger aircraft, such as the CRJ 900 with 80 seats could be placed in service at COU for either new markets or to replace CRJ 700 aircraft in existing markets. Eventually, the use of larger aircraft will result in a leveling off of commercial operations as additional demand is accommodated with more seats in the market rather than additional operations.

Table 3.14 presents the base case projections for enplaned passengers during the projection period. Also shown are the base case commercial departures. It is assumed one additional daily frequency is added every three years for the first nine years of the forecast. Beginning in the tenth year (2024), the number of operations levels off, indicating that additional demand will be served by larger aircraft on certain frequencies, rather than adding departures.

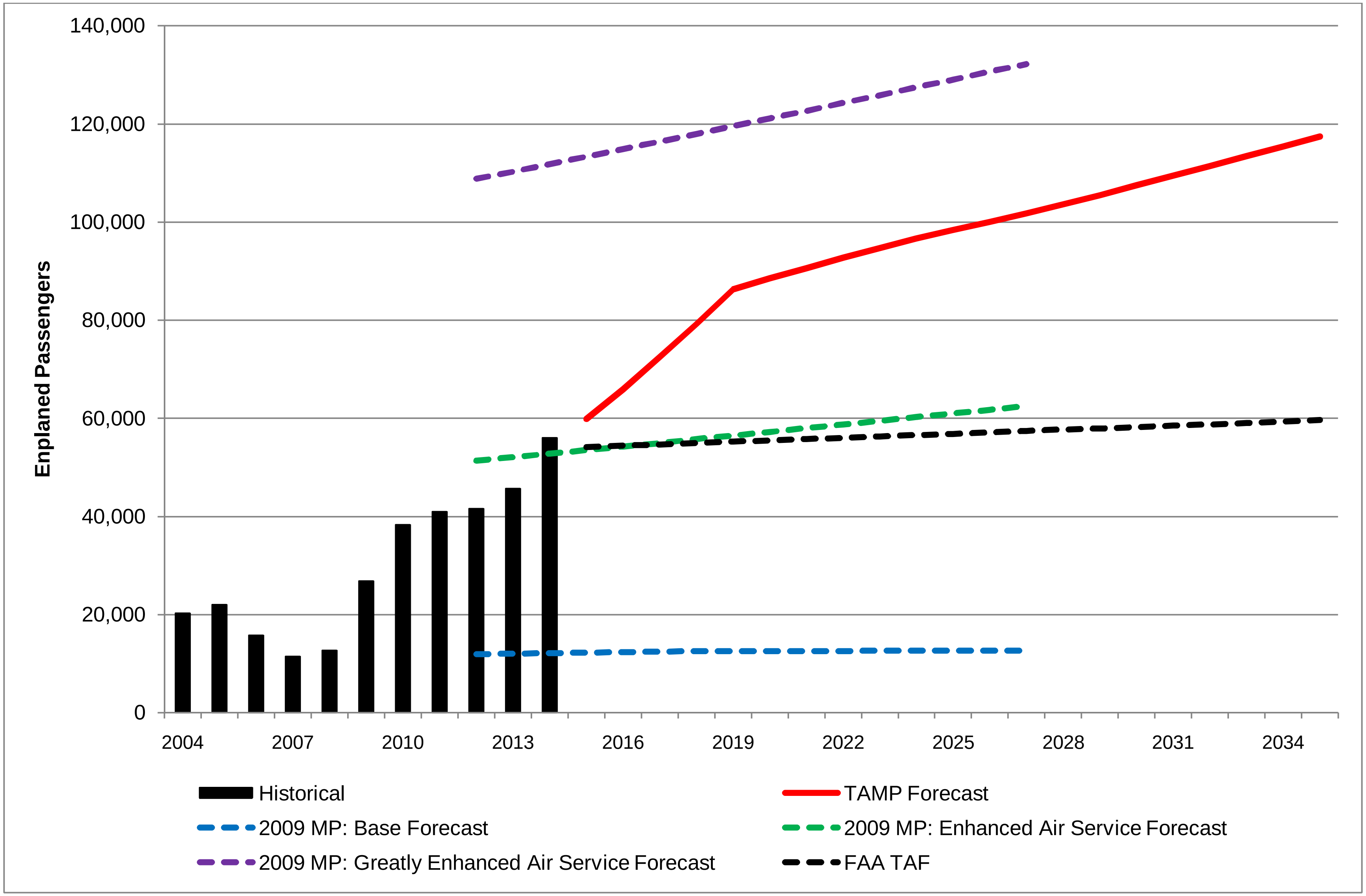
Exhibit 3.16 shows the results of the enplaned passenger forecast compared with historical enplanement activity at COU, the previous COU Master Plan forecasts, and the current FAA Terminal Area Forecast.

Table 3.14 Enplaned Passenger Forecast

Year	COU Enplanements	Regional Enplanements (COU+STL+MCI)	COU Market Share	Commercial Service Departures
2014	56,080	11,051,903	0.507%	1,727
2015	59,910	10,952,387	0.547%	1,818
2016	65,947	11,243,158	0.586%	1,818
2017	72,522	11,583,786	0.626%	1,818
2018	79,281	11,912,016	0.665%	1,818
2019	86,278	12,237,885	0.704%	1,818
2020	88,576	12,563,817	0.704%	1,818
2021	90,626	12,854,649	0.703%	2,182
2022	92,728	13,152,822	0.703%	2,182
2023	94,734	13,437,352	0.703%	2,182
2024	96,612	13,703,778	0.702%	2,182
2025	98,364	13,952,259	0.702%	2,182
2026	100,061	14,192,883	0.702%	2,182
2027	101,811	14,441,129	0.702%	2,182
2028	103,633	14,699,635	0.702%	2,182
2029	105,512	14,966,043	0.702%	2,182
2030	107,476	15,244,638	0.702%	2,182
2031	109,432	15,522,165	0.702%	2,182
2032	111,400	15,801,285	0.702%	2,182
2033	113,415	16,087,137	0.702%	2,182
2034	115,444	16,374,864	0.702%	2,182
2035	117,498	16,666,292	0.702%	2,182
Compounded Annual Growth Rate				
2014-2020	7.9%	2.2%	5.6%	0.9%
2020-2035	1.9%	1.9%	0.0%	1.2%
2014-2035	3.6%	2.0%	1.6%	1.1%

Sources: Airport Management; FAA Terminal Area Forecast; Parsons Brinckerhoff analysis.

Exhibit 3.16 Comparison of Enplaned Passenger Forecast



Sources: Airport Management; FAA Terminal Area Forecast; Columbia Regional Airport Master Plan Update; Parsons Brinckerhoff analysis.

3.3.2 General Aviation Activity

The FAA Terminal Area Forecast provides the basis for the projections of COU's general aviation activity. Since the Terminal Area Forecast data for 2014 are estimates, the general aviation aircraft operations forecasts developed for this analysis were developed by applying the Terminal Area Forecast annual growth rates for general aviation aircraft operations at COU to the actual Air Traffic Control Tower data for 2014. As previously mentioned, COU's overall share of the FAA Central Region's general aviation aircraft operations has decreased from 2004 to 2014; however, since the economic crisis of 2008 that had a marked impact on general aviation activity, the share of COU's general aviation aircraft operations to that of the FAA Central Region has stabilized to be approximately 0.43 percent. **Table 3.15** presents the general aviation aircraft operations forecast.

Table 3.15 Projected COU General Aviation Aircraft Operations

Year	COU General Aviation Operations	% Change	FAA Central Region (in 000s)	% Change	U.S. (in 000s)	% Change	COU Share Central Region	COU Share U.S.
2014	15,913		3,722.0		25,651.6		0.428%	0.0620%
2015	16,076	1.0%	3,722.7	0.0%	25,739.3	0.3%	0.432%	0.0625%
2016	16,131	0.3%	3,725.8	0.1%	25,841.2	0.4%	0.433%	0.0624%
2017	16,186	0.3%	3,729.0	0.1%	25,943.9	0.4%	0.434%	0.0624%
2018	16,242	0.3%	3,732.2	0.1%	26,047.6	0.4%	0.435%	0.0624%
2019	16,297	0.3%	3,735.4	0.1%	26,152.1	0.4%	0.436%	0.0623%
2020	16,352	0.3%	3,738.6	0.1%	26,257.5	0.4%	0.437%	0.0623%
2021	16,409	0.3%	3,741.8	0.1%	26,363.8	0.4%	0.439%	0.0622%
2022	16,465	0.3%	3,745.1	0.1%	26,471.0	0.4%	0.440%	0.0622%
2023	16,522	0.3%	3,748.4	0.1%	26,579.2	0.4%	0.441%	0.0622%
2024	16,578	0.3%	3,751.7	0.1%	26,688.2	0.4%	0.442%	0.0621%
2025	16,634	0.3%	3,755.0	0.1%	26,798.2	0.4%	0.443%	0.0621%
2026	16,691	0.3%	3,758.3	0.1%	26,909.2	0.4%	0.444%	0.0620%
2027	16,747	0.3%	3,761.7	0.1%	27,021.2	0.4%	0.445%	0.0620%
2028	16,803	0.3%	3,765.1	0.1%	27,134.1	0.4%	0.446%	0.0619%
2029	16,861	0.3%	3,768.5	0.1%	27,248.0	0.4%	0.447%	0.0619%
2030	16,919	0.3%	3,772.0	0.1%	27,363.0	0.4%	0.449%	0.0618%
2031	16,977	0.3%	3,775.5	0.1%	27,478.9	0.4%	0.450%	0.0618%
2032	17,035	0.3%	3,779.0	0.1%	27,595.9	0.4%	0.451%	0.0617%
2033	17,094	0.3%	3,782.5	0.1%	27,713.9	0.4%	0.452%	0.0617%
2034	17,152	0.3%	3,786.1	0.1%	27,833.0	0.4%	0.453%	0.0616%
2035	17,210	0.3%	3,789.7	0.1%	27,953.2	0.4%	0.454%	0.0616%
Compounded Annual Growth Rate								
2014-2020	0.5%		0.1%		0.4%			
2020-2035	0.3%		0.1%		0.4%			
2014-2035	0.4%		0.1%		0.4%			

Sources: Air Traffic Control Tower Data (2014); Terminal Area Forecast; *FAA Aerospace Forecast*; Parsons Brinckerhoff

3.3.3 Military Activity

For military operations, the growth rates identified in the Terminal Area Forecast were also used. This is primarily due to military aircraft operations that are projected for both the airport and the nation to remain constant through 2035. The Terminal Area Forecast was also used to allocate the general aviation aircraft operations forecast between itinerant and local aircraft operations.

Table 3.16 presents the projected military aircraft operations. As shown, military aircraft operations are projected to remain flat throughout the projection period.

Table 3.16 Projected COU Military Aircraft Operations

Year	Local Aircraft Operations	Itinerant Aircraft Operations	Total Military Aircraft Operations	% Change
2014	990	582	1,572	
2015	990	582	1,572	0.00%
2016	990	580	1,570	-0.14%
2017	990	580	1,570	0.00%
2018	990	578	1,568	-0.14%
2019	990	578	1,568	0.00%
2020	990	575	1,565	-0.14%
2021	990	575	1,565	0.00%
2022	990	575	1,565	0.00%
2023	990	573	1,563	-0.14%
2024	990	573	1,563	0.00%
2025	990	573	1,563	0.00%
2026	990	573	1,563	0.00%
2027	990	573	1,563	0.00%
2028	990	573	1,563	0.00%
2029	990	573	1,563	0.00%
2030	990	573	1,563	0.00%
2031	990	573	1,563	0.00%
2032	990	573	1,563	0.00%
2033	990	573	1,563	0.00%
2034	990	573	1,563	0.00%
2035	990	573	1,563	0.00%
Compounded Annual Growth Rate				
2014-2020	0.0%	-0.2%	-0.1%	
2020-2035	0.0%	0.0%	0.0%	
2014-2035	0.0%	-0.1%	0.0%	

Sources: Air Traffic Control Tower Data (2014); Terminal Area Forecast; Parsons Brinckerhoff

3.3.4 Based Aircraft Fleet Mix Forecast

As previously mentioned, the U.S. general aviation industry has experienced a marked decrease in aircraft shipments in the last 10 years. In addition, the FAA Aerospace Forecast expects extremely modest growth in the number of general aviation aircraft during the next 20 years. The projected based aircraft fleet mix for COU was estimated by applying anticipated growth trends by type of aircraft contained in the FAA Aerospace Forecast to actual 2014 based aircraft.

Table 3.17 presents the based aircraft fleet mix for COU through 2035. As shown, the combined percentage distribution for single-engine and multi-engine aircraft is projected to decrease from 77 percent in 2014 to 58 percent in 2035. The percentage distribution of turbine and jet aircraft is projected to increase from 23.5 percent in 2014to 42.2 percent in 2035.

Table 3.17 Projected Based Aircraft Fleet Mix

Year	Single Engine	Multi Engine	Jet	Helicopter	Total
2014	17	9	8	-	34
2020	17	9	15	-	41
2025	17	9	19	-	45
2030	17	9	19	-	45
2035	17	9	19	-	45
Percentage Distribution					
2014	50.0%	26.5%	23.5%	0.0%	100.0%
2020	41.5%	22.0%	36.6%	0.0%	100.0%
2025	37.8%	20.0%	42.2%	0.0%	100.0%
2030	37.8%	20.0%	42.2%	0.0%	100.0%
2035	37.8%	20.0%	42.2%	0.0%	100.0%

Source: Parsons Brinckerhoff

3.4 Forecast Scenarios

Per the scope of work for the development of the aviation demand forecasts, two additional passenger enplanement scenarios have been prepared for this study. These scenarios address potential variations to the base case passenger enplanements forecast that could result from significant pattern changes in existing air service at COU. A description of the scenarios is presented below.

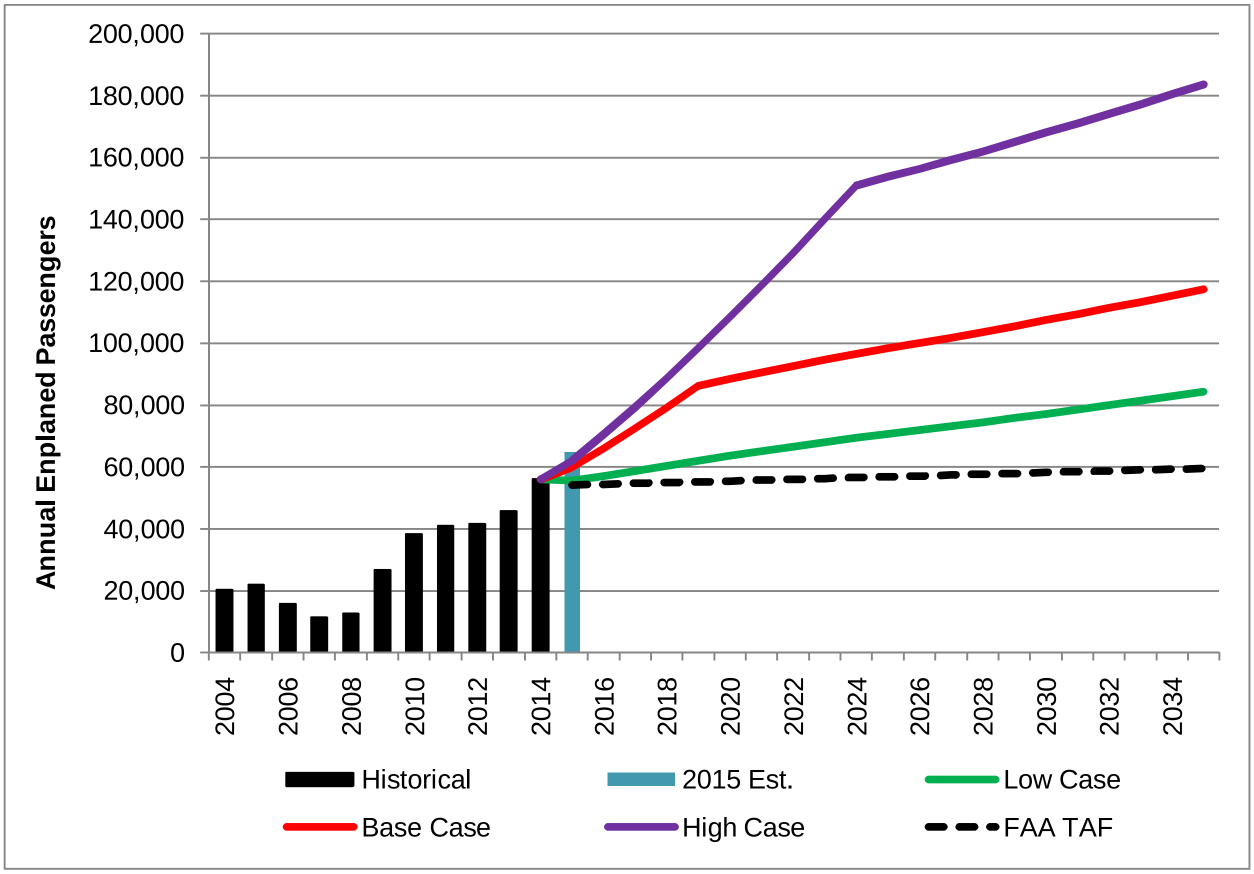
- The Low Case scenario assumes there is no additional growth in the COU market and COU's share of enplanements for the combined total of COU, MCI, and STL remains constant at 2014 levels for the duration of the forecast period. In this scenario, the enplanement to population ratio for COU increases slightly to 0.38 in 2030 (the last year for which population projections are available), which is still well below the median and average for the benchmarked airports described in Table 3.13.

- The High Case scenario includes a higher growth rate in COU's share of the combined total of COU, MCI, and STL enplanements for a longer period of time (10 years) as compared to the base case. In this case the enplanement to population ratio is 0.82 in 2030, which is approximately the average enplanement to population ratio for the benchmarked airports.

Exhibit 3.17 presents a comparison of the enplanements for the base case forecast to the high and low scenarios. Also included is an estimate of the enplaned passenger activity anticipated at COU in 2015 based on year-to-date activity through April, and historical patterns over the previous four years. Since 2011, approximately 31 percent of annual activity occurs between

January and April. When applied to the 2015 YTD (through April 30) passenger enplanements of 20,600, an estimated 62,000-65,000 enplanements could be expected at COU over the course of 2015.

Exhibit 3.17 Enplaned Passenger Forecast Scenarios



Source: Parsons Brinckerhoff

3.5 Peak Aircraft Enplanement and Operations Forecast

To adequately plan for the projected level of activity at an airport, a planning day incorporates the concept of the average day of the peak month (ADPM). The peak hour activity on that day is also a significant planning criterion as it is more important in sizing facilities than average daily passenger levels.

For this forecast, projections of average day peak hour enplanements and average day peak month aircraft operations were developed. Records for COU indicate that approximately 10 percent of total annual enplanements occur in the peak month, which is close to typical for U.S. airports. This percentage was applied to total annual enplanements to determine the peak month enplanements. The peak month enplanements were then divided by 31 to determine the average day, peak month enplanements for the master plan forecast. Peak hour enplanements are determined by multiplying a higher than average (85 percent) load factor by the projected number of peak hour operations and the number of seats of the aircraft for the time period. As mentioned in Section 3.3.1, it is likely that as passenger demand increases, existing and added flights will be operated using larger aircraft, which is consistent with the FAA Aerospace Forecast fleet mix trend toward larger aircraft. For the high enplanement scenario, it may be possible to have three peak hour operations, which translates into a peak hour passenger level of 230 peak hour passengers for 2030 and 242 peak hour passengers in 2035.

Air traffic control data indicate that the peak month for combined general aviation and military aircraft operations is approximately 11 percent of annual activity. The general aviation and military aircraft operations forecasts were multiplied by this percentage to determine peak month traffic and then again divided by 30.5 days per month to determine the ADPM traffic. These calculations result in the average day, peak month estimates for the base case forecast presented in **Table 3.18**. Average day peak month activity increases from 181 enplanements in 2014 to 379 enplanements in 2035 for the base forecast, and 62 general aviation and military aircraft operations per day in 2014 to 65 aircraft operations per day in 2035.

Table 3.18 Summary of Peak Activity (Base Case Forecast)

Item	2014	2020	2025	2030	2035
Commercial Service Enplanements and Operations					
Annual Enplanements	56,080	88,576	98,364	107,476	117,498
Peak Month Enplanements (10% of annual)	5,608	8,858	9,836	10,748	11,750
Average Day Peak Month Enplanements	181	286	317	347	379
Peak Hour (ADPM) Operations	2	2	2	2	2
Peak Hour (ADPM) Enplanements	111	111	136	153	162
General Aviation and Military Operations					
Annual GA & Military Aircraft Operations	17,485	17,917	18,197	18,482	18,773
Peak Month Operations (11% of annual)	1,923	1,971	2,002	2,033	2,065
ADPM GA & Military Aircraft Operations	64	65	66	67	68

Source: Parsons Brinckerhoff

3.6 Forecast Summary

Commercial passenger activity at Columbia Regional Airport has increased significantly over the past several years, especially when compared to national trends. The recent changes in air service and increases in passenger enplanements at the Airport have resulted in passenger activity in 2014 and 2015 at the level of the current FAA Terminal Area Forecast for COU projected for 2035. COU had 56,000 enplanements in CY 2014 and is on pace to exceed 65,000 enplanements in 2015. A summary of the aviation activity forecasts utilizing the FAA template for comparing projections to the FAA Terminal Area Forecasts are presented in **Tables 3.19 and 3.20**.

Table 3.19 FAA Template for Summarizing and Documenting Airport Planning Forecasts

A. Forecast Levels and Growth Rate									
Base Year: 2014	**2014**	**2020**	**2025**	**2030**	**2035**	**Average CAGR**			
	Base Yr. Level	Base Yr. + 6yr.	Base Yr. + 11yr.	Base Yr. + 16yr.	Base Yr. + 21yr.	Base Yr. + 6yr.	Base Yr. + 11yr.	Base Yr. + 16yr.	Base Yr. + 21yr.
Passenger Enplanements									
TOTAL Air Carrier & Commuter	56,080	88,576	98,364	107,476	117,498	7.9%	5.2%	4.1%	3.6%
Operations									
Itinerant									
Commercial	3,453	3,636	4,364	4,364	4,364	0.9%	2.2%	1.5%	1.1%
General Aviation	10,774	10,878	11,057	11,238	11,421	0.2%	0.3%	0.3%	0.3%
Military	582	575	573	573	573	-0.2%	-0.1%	-0.1%	-0.1%
Local									
General Aviation	5,139	5,474	5,577	5,681	5,789	1.1%	0.7%	0.6%	0.6%
Military	990	990	990	990	990	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	20,938	21,553	22,561	22,846	23,137	0.5%	0.7%	0.5%	0.5%
Instrument Operations(1)	736	757	830	838	845	0.5%	1.1%	0.8%	0.7%
Peak Hour Operations	64	65	66	67	68	0.3%	0.3%	0.3%	0.3%
Cargo/Mail(2) **(enplaned+deplaned tons)**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Based Aircraft									
Single Engine (Nonjet)	17	17	17	17	17	0.0%	0.0%	0.0%	0.0%
Multi Engine (Nonjet)	9	9	9	9	9	0.0%	0.0%	0.0%	0.0%
Jet Engine	8	15	19	19	19	11.0%	8.2%	5.6%	4.2%
Helicopter	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Other	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
TOTAL	34	41	45	45	45	3.2%	2.6%	1.8%	1.3%

B. Operational Factors	**2014**	**2020**	**2025**	**2030**	**2035**
	Base Yr. Level	Base Yr. + 6yr.	Base Yr. + 11yr.	Base Yr. + 16yr.	Base Yr. + 21yr.
Avg. aircraft size (seats)	65	69	69	72	72
Avg. enplaning load factor	64%	86%	78%	80%	88%
GA operations per based aircraft	468	399	370	376	382

Notes:

(1) Instrument Operations estimated using same methodology as 2009 COU Master Plan Update.

(2) Cargo/Mail tonnage not forecasted as part of the Terminal Area Master Plan.

Table 3.20 FAA Template for Comparing Airport Planning and TAF Forecasts

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base Yr. Level	2014	56,080	47,685	17.6%
Base Yr. + 6yr.	2020	88,576	55,508	59.6%
Base Yr. + 11yr.	2025	98,364	56,859	73.0%
Base Yr. + 16yr.	2030	107,476	58,242	84.5%
Base Yr. + 21yr.	2035	117,498	59,654	97.0%
Commercial Operations				
Base Yr. Level	2014	3,453	3,453	0.0%
Base Yr. + 6yr.	2020	3,636	3,722	-2.3%
Base Yr. + 11yr.	2025	4,364	3,792	15.1%
Base Yr. + 16yr.	2030	4,364	3,862	13.0%
Base Yr. + 21yr.	2035	4,364	3,937	10.8%
Total Operations				
Base Yr. Level	2014	20,938	21,370	-2.0%
Base Yr. + 6yr.	2020	21,553	22,287	-3.3%
Base Yr. + 11yr.	2025	22,561	22,650	-0.4%
Base Yr. + 16yr.	2030	22,846	23,018	-0.7%
Base Yr. + 21yr.	2035	23,137	23,398	-1.1%

Note:
1. FAA TAF data is on U.S. Government fiscal year basis (October through September). Airport forecast is on a calendar year basis.

For subsequent chapters of the Terminal Area Master Plan, references to specific years in relation to forecasted activity will be minimized, and instead Planning Activity Levels (PALs) will be emphasized. The purpose of the PALs is to guide Airport staff and officials in determining when airport facilities need expansion or upgrades according to activity levels instead of calendar years. By referencing decision to activity levels and not specific dates, airport operators can be flexible and responsive to actual (rather than projected) aviation demand levels with regard to development needs. The Planning Activity Levels and their associated enplaned passenger values will be discussed in more detail in Chapter 4.

3.7 Critical Design Aircraft

The FAA classifies airports according to the size of aircraft that are currently using an airport, or are expected to use an airport in the future. For the purposes of applying appropriate FAA design standards, aircraft are classified based on their performance (approach speeds for landing) and physical characteristics (wingspan, tail height, landing gear configuration). Using this classification system, the existing and future design aircraft are identified in order to determine the appropriate airport design standards for the various airfield elements to be evaluated.

Planning for future activity for the terminal area at COU requires the identification of a critical design aircraft. As defined in FAA Advisory Circular 150/5300-13A, the critical design aircraft may be one single aircraft or a collection of aircraft which generate a minimum of 500 annual aircraft operations or 250 annual aircraft departures. At airports with commercial service, the most demanding aircraft with regularly scheduled commercial service would serve as the critical design aircraft even if the number of annual operations does not exceed 500.

For the purposes of this Terminal Area Master Plan, only commercial service and charter aircraft will be considered in establishing the existing and future critical design aircraft for the terminal areas. The critical design aircraft established during the Master Plan for the other airfield facilities (such as the runways and taxiways) will remain unchanged.

3.7.1 Aircraft Classification

FAA Advisory Circular 150/5300-13A classifies aircraft through three parameters: the Aircraft Approach Category (AAC), the Airplane Design Group (ADG), and the Taxiway Design Group (TDG).

The AAC relates to aircraft approach speeds and is represented by a letter (A through E), as shown in **Table 3.21**. ADG is represented by a Roman numeral and relates to an aircraft's wingspan or tail height, whichever is the most restrictive, as shown in **Table 3.22**. The AAC and ADG aircraft classifications are combined to develop the Airport Reference Code (ARC) designation. The TDG relates to the undercarriage dimensions of an aircraft and determines criteria relating to an airport's taxiway system.

These parameters represent the aircraft that are intended to be accommodated by the Airport throughout the 20-year planning period. Careful consideration for the safe operation of aircraft is the primary goal of applying these airport planning design standards for future improvements.

Table 3.21 Aircraft Approach Category (AAC)

Aircraft Approach Category	Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speeds 166 knots or more

Source: FAA Advisory Circular 150,5300-13A, Airport Design

Table 3.22 Airplane Design Group (ADG)

Group No.	Tail Height (ft [m])	Wingspan (ft [m])
I	<20' (<6m)	<49' (<15m)
II	20' - 30' (6m - <9m)	49'-<79' (15 - <24m)
III	30' - <45' (9m - <13.5m)	79' - <118' (24m - <36m)
IV	45' - <60' (13.5m <18.5m)	188' - <171' (36m - <52m
V	60' - <66' (18.5m - <20m)	171' - <214' (52m - <65m)
VI	66' - <80' (20m - <24.5m)	214' - <262' (65m - <80m)

Source: FAA Advisory Circular 150, 5300-13A, Airport Design

3.7.2 Existing Critical Design Aircraft

Table 3.23 shows the historical operations of aircraft typically seen in the COU terminal area for commercial service and charter operations since 2012 based on data from the FAA's Traffic Flow Management System Counts (TFMSC) database. The current (2015) critical design aircraft for COU terminal and charter operations is the Bombardier CRJ-700 series aircraft, which has an ARC of C-II. As mentioned in Section 3.2.2 above, American Airlines transitioned to this aircraft for nonstop service to ORD and DFW beginning in January 2015.

Table 3.23 Historical Annual Operations by Aircraft Type in Terminal Area

Aircraft	ARC	Annual Operations			
		2012	2013	2014	2015(1)
Bombardier CRJ-700	C-II	5	8	3	918
Embraer ERJ 135/140/145	C-II	26	1,824	2,737	236
Bombardier CRJ-100/200	C-II	1,856	216	96	64
ARC C/D-II Subtotal		***1,887***	***2,048***	***2,836***	***1,218***
Boeing 727 Series	C-III	2	0	0	0
Boeing 737 Series	C/D-III	40	72	38	39
Boeing MD 80/90 Series	C/D-III	5	12	24	12
ARC C/D-III Subtotal		***47***	***84***	***62***	***51***
Boeing 757 Series	C-IV	12	14	14	0
Boeing 767 Series	C-IV	7	2	6	2
Boeing 747 Series	D-V	1	0	0	0
ARC C/D-IV Subtotal		***20***	***16***	***20***	***2***

Notes:
(1) 2015 TFMSC data covers January through May 2015.

Source: FAA Traffic Flow System Management Counts, accessed July 20, 2015; compiled by Parsons Brinckerhoff.

3.7.3 Future Critical Design Aircraft

Commercial service at COU currently consists of four daily departures by American Airlines: two to DFW, two to ORD. Beginning in January 2015, these routes use the CRJ-700 series aircraft which has a C-II classification. As passenger enplanements increase over the planning period, it is anticipated that American Airlines will either increase the frequency of these routes and/or change their fleet to accommodate more passengers per flight. Based on discussions with the Airport and airline staff in the spring of 2015, the potential exists for at least one flight on one of the routes being upgraded to CRJ-900 series service beginning in the near future. The conversion of one flight route to one destination per day to utilize the CRJ-900 series aircraft, which has an ARC of C-III, would yield greater than 500 annual aircraft operations for future activity.

Additional carriers entering the commercial service market at COU will likely be done with aircraft of a similar size seat-wise as American's service with the regional jets (65-90 seats) or with less frequent service on larger aircraft such as the Boeing 737 series and the MD 80/90 series aircraft. In either case, it is not anticipated that new commercial service through the introduction of an additional air carriers would yield a critical design aircraft greater than an ARC C-III or D-III which have the same airfield design standards.

Charter service, while anticipated to increase at COU, is not expected to exceed 500 annual operations for aircraft larger than ARC C/D-III. Apron/gate space planning for terminal facility requirements should account for periodic use of the terminal facility for aircraft such as the Boeing 757 and 767 series. However, based on the anticipated low number of operations these larger aircraft design standards in comparison to the commercial service aircraft, airfield design standards higher than C/D-III are not recommended for the terminal area.

Table 3.24 presents an estimate by aircraft type and ARC of commercial service and charter operations through the planning period for the selected forecast.

Table 3.24 Projected Annual Operations by Aircraft Type in Terminal Area

Aircraft	ARC	Annual Operations			
		2020	2025	2030	2035
Bombardier CRJ-700	C-II	2,900	2,900	2,200	2,100
Embraer ERJ 135/140/145	C-II	200	200	190	170
Bombardier CRJ-100/200	C-II	440	400	380	340
ARC C/D-II Subtotal		***3,540***	***3,500***	***2,770***	***2,610***
Boeing 737 Series	C/D-III	40	60	80	100
Boeing MD 80/90 Series	C/D-III	10	30	70	150
Bombardier CRJ-900	C-III	0	725	1,400	1,450
ARC C/D-III Subtotal		***50***	***815***	***1,550***	***1,700***
Boeing 757 Series **Boeing 767 Series** **Boeing 747 Series**	C-IV C-IV D-V	30	40	40	50
ARC C/D-IV Subtotal		***30***	***40***	***40***	***50***

Source: Parsons Brinckerhoff, 2015.

The 2009 Master Plan Update projected the ultimate critical design aircraft for COU to be the Boeing 757-200F (ARC D-IV) for Runway 2-20 and the King Air 200/300 or similar sized small business jet (ARC B-II) for Runway 13-31[4].

Additional airfield design standards discussion related to the critical design aircraft for the terminal area and the potential impacts to the airfield will be included in Chapter 4 – Facility Requirements, and Chapter 5 – Alternatives Analysis.

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[4] Sections 3.2.3 and 3.2.4, and Table 3-2, Columbia Regional Airport Master Plan Update, RS&H, September 2009.

4 TERMINAL AREA FACILITY REQUIREMENTS

This chapter provides a technical presentation of terminal area facility requirements for Columbia Regional Airport. The primary purpose of this analysis is to compare existing terminal area facilities to the projected aviation passenger demand in order to determine the timeframe in which capacity constraints occur. It should be noted that the timing of the development of any new facilities should depend on the rate of growth that actually occurs at the Airport.

4.1 Planning Activity Levels

For the purpose of the analysis in the remainder of this report, references to specific years will be minimized in this and subsequent sections, and instead Planning Activity Levels (PALs) will be emphasized. The purpose of the PALs is to guide Airport staff and officials, in determining when airport facilities need expansion or upgrades according to activity levels instead of calendar years. By referencing decisions to activity levels and not specific dates, airport operators can be flexible and responsible with regard to development needs.

Chapter 3 outlined a range of possible forecast scenarios in addition to the FAA Terminal Area Forecast. There is significant spread in these forecasts with long range (2035) passenger enplanements estimated to be between approximately 84,400 (Low Case) and 183,700 (High Case). When a range of scenarios is possible, it is recommended that terminal planning be based on a set of PALs which represent reasonable increments of development. The timing of these phases will be determined as the actual growth of the Airport occurs.

Based on the selected forecast scenario and the high forecast scenario presented in Chapter 3, **Table 4.1** presents the annual enplanement levels recommended for terminal planning purposes for COU. Table 4.1 also includes the approximate years that the levels correspond to for each forecast, including the FAA Terminal Area Forecast.

Table 4.1 Planning Activity Levels

PAL	Annual Enplanements	Low Case Forecast Year	Base Case Forecast Year(1)	High Case Forecast Year	FAA TAF Year
1	90,000	>2035	2021	2019	>2035
2	105,000	>2035	2029	2020	>2035
3	120,000	>2035	>2035	2022	>2035
4	150,000	>2035	>2035	2024	>2035
5	190,000	>2035	>2035	>2035	>2035

Notes:
(1) Selected Passenger Forecast

4.2 Design Level Activity

Airport terminal facilities are sized to accommodate the peak hour passenger volumes of a design day. Annual enplanements are an indicator of over-all airport size, however peak hour volumes more accurately determine the demand for airport facilities based upon the specific user patterns of a given airport. Peak hour passengers are typically defined as Peak Hour-

Average Day-Peak Month (PHADPM) passengers, and are also often referred to as Design Hour passengers. The Design Hour measures the number of enplaned and deplaned passengers departing, or arriving, on aircraft in an elapsed hour of a typically busy (design) day. The Design Hour typically does not correspond exactly to a "clock hour" such as 7:00-7:59 but usually overlaps two "clock hours", i.e. 7:20-8:19 reflecting airline scheduling patterns.

The Design Hour is typically not the absolute peak level of activity, nor is it equal to the number of persons occupying the terminal at a given time. It is, however, a level of activity which the industry has traditionally used to size many terminal facilities. The number of persons in the terminal during peak periods, including visitors and employees, is also typically related to Design Hour passengers.

Each airport also has its own distinct peaking characteristics due to differences in airline schedules; business or leisure travel; long or short haul flights; and the mix of mainline jets and regional aircraft. These peaking characteristics determine the size and type of terminal facilities. Thus, two airports with similar numbers of annual passengers may have different terminal requirements, even if the Design Hour passenger volumes are approximately the same.

4.2.1 Existing Activity

Since the deregulation of the airlines, most major airlines have developed "hub and spoke" route systems such as American's hubs in Chicago and Dallas/Ft. Worth; Delta's in Atlanta and Salt Lake City; United's in Chicago and Denver, etc. At these hubs there are a number of banks of flights when most passengers change planes to reach their final destination. These banks of connecting flights form a series of peaks during the day - typically seven to ten.

In contrast, the other cities served by the airlines are referred to as "spokes". Individual airline schedules at the spoke cities are generally tied to the connecting banks at the hub. Most airlines have similar scheduling patterns and these tend to reinforce each other at the spoke airports resulting in, for example, a large number of departures between 7 and 7:30 a.m. As passenger volumes on specific routes increase, the number of flights also tends to increase which can fill in the ‘valleys’ during the day.

The daily pattern of flight activity and passenger peaking at COU is typical of spoke activity at a small (non-hub in FAA terminology) airport. At present, there is only regional jet (RJ) service from American Airlines to two hub cities - Chicago O’Hare (ORD) and Dallas/Ft. Worth (DFW). These flights have been primarily served in the last several years by Embraer 135, Embraer 145, and Bombardier CRJ-700 series aircraft. In the past, COU has had service from other airlines at various times, almost exclusively with smaller turboprop aircraft of less than 50 seats, and the terminal was originally planned for these types of aircraft. Although passenger activity is at an all-time high with these two markets, the Airport is actively marketing itself to other airlines.

Both ORD and DFW have two flights with early morning and afternoon departures. Arrivals are in the afternoon and late evening. In the current (Summer/Fall 2015) scheduling, all of these flights are separated so the terminal only has one active flight at a time. However, in other years - and as recently as 2014 - the morning departures occurred within the same 60 minute period, and sometimes the late evening arrivals overlapped as well. This scheduling is dictated by hub connections and other airline network issues.

4.2.2 Projected Design Hour Activity

The peak month has represented between 8.9% and 11.5% of annual enplanements or deplanements since 2003[12]. The peak month for both has been in October for most years. Because there is no obvious trend in peak month percentages, an average of 10.0% has been used for planning. All of the peak months had 31 days.

As noted in Chapter 3, charter passengers are included in the annual totals, but are not handled in the terminal.

Typically design hour passengers are calculated as a percentage of the average day / peak month (ADPM) passengers based on actual passengers or scheduled seats. Often this is assumed to reduce to some extent over time due to peak spreading.

However, for small airports like COU, the addition or shifting of a single flight can radically change these percentages. For example, in August 2014, the two morning departures and midafternoon arrivals occurred within the same 60 minute period. In 2015 the schedules changed so that these flights occurred at least an hour apart, but the number of daily flights did not change. At the same time, the size of aircraft was increased from 44/50 seats to 65 seats. All of these small changes have major impacts on terminal facilities.

For COU a different approach has been based on air service assumptions for the design hours and how increases in ADPM passengers could be accommodated.

The basic air service assumptions are:

- COU would remain a RJ airport with service by 65 seat and (eventually) 90 seat aircraft.
- For PALs 1 & 2, increases in daily passengers would be from additional daily flights to existing markets and an increase in aircraft size. Both morning departures could occur in the peak hour, with one of these flights increasing in size in PAL 2. Arrivals are still expected to be spread out in PAL 1, but potentially overlap in PAL 2.
- In PAL 3 a new market is assumed to be added which would also add to the departing design hour. In PAL 4/5 an additional market would be added for a total of 4 design hour departures. Design hour arrivals would also increase but as typical of most airports, not as concentrated as the departures peak.
- A 90% design hour aircraft load factor has been assumed for all PALs.

The design hour passenger levels using the basic air service assumptions are shown in **Table 4.2**. As shown in the table, when analyzing design hour operations and passenger levels, aircraft departures and arrivals do not necessarily equal each other. For example, in PAL 1 it is assumed that the peak period for departures would occur in the morning with two flights taking off within a 60 minute period. The arrivals peak for PAL 1 is assumed to remain the same as existing conditions where two arriving aircraft never overlap within the same 60 minute period.

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[12] Peak month percentage range excludes 2008 when service was suspended and then re-instated by larger aircraft.

This overlap effect for departing and arriving aircraft carries through to the variances between design hour enplaned and deplaned passengers.

Table 4.2 Forecast Design Hour Passengers

Item		**Planning Activity Level**				
	2015	**1**	**2**	**3**	**4**	**5**
Annual Enplanements	65,000	90,000	105,000	120,000	150,000	190,000
Peak Month Enplanements						
% of Annual Enplanements	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Peak Month Enplanements	6,500	9,000	10,500	12,000	15,000	19,000
ADPM Enplanements(1)	210	290	340	390	480	610
Design Hour Flights						
Departures						
65 Seat Aircraft	1	2	1	2	3	2
90 Seat Aircraft	0	0	1	1	1	2
Design Hour Seats (Departures)	65	130	155	220	285	310
Arrivals						
65 Seat Aircraft	1	1	1	1	2	1
90 Seat Aircraft	0	0	1	1	1	2
Design Hour Seats (Arrivals)	65	65	155	155	220	245
Design Hour Passengers(2)						
Enplaned	60	120	140	200	260	280
Deplaned	60	60	140	140	200	230

Notes:
(1) Assumes peak month contains 31 days
(2) 90% design hour load factor assumed for all PALs

Source: Hirsh Associates

It is possible that an ultra-low cost carrier (ULCC) such as Allegiant or Spirit might provide low frequency service to certain vacation destinations as they have done at many other small airports. Experience at other small airports is that on the days they operate, flights tend to occur outside the peak hours of the other carriers - they usually arrive and depart in mid-morning to midafternoon and do not overlap the main airline flights.

Table 4.3 estimates how these flights (assumed to average 170 seats) could establish its own design hour (PAL 2) and overlap one or two other airlines' flights that might occur during the mid-day period when a second or third RJ flight to a city could occur. Comparing Tables 4.2 and 4.3 indicates that a ULCC could slightly increase design hour passengers in PALs 2 & 3, but be similar to the basic air service assumptions in the later PALs.

In summary, the design hour passengers under the two air service scenarios have relatively small differences. The key will be to program and plan the terminal to be flexible enough to handle either scenario. In the following section, design hour passengers from the basic air service assumptions have been used, with flexibility provided to accommodate ULCC activity.

Table 4.3 Forecast Design Hour Passengers (ULCC Scenario)

Item		Planning Activity Level				
	2015	1	2	3	4	5
Annual Enplanements	65,000	90,000	105,000	120,000	150,000	190,000
Peak Month Enplanements						
% of Annual Enplanements	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Peak Month Enplanements	6,500	9,000	10,500	12,000	15,000	19,000
ADPM Enplanements(1)	210	290	340	390	480	610
Design Hour Flights						
Departures						
65 Seat Aircraft	1	2	0	1	0	2
90 Seat Aircraft	0	0	0	0	1	0
170 Seat Aircraft	0	0	1	1	1	1
Design Hour Seats (Departures)	65	130	170	235	260	300
Arrivals						
65 Seat Aircraft	1	1	0	0	1	0
90 Seat Aircraft	0	0	0	0	0	1
170 Seat Aircraft	0	0	1	1	1	1
Design Hour Seats (Arrivals)	65	65	170	170	235	260
Design Hour Passengers(2)						
Enplaned	60	120	160	220	240	270
Deplaned	60	60	160	160	220	240

Notes:

(1) Assumes peak month contains 31 days

(2) 90% design hour load factor assumed for all PALs

Source: Hirsh Associates

4.3 Passenger Terminal Facilities Planning Criteria

Terminal facility requirements for an airport (the terminal program) are a function of the specific and unique characteristics of that airport. These include the design levels of passenger and aircraft activity; the number and type of airlines serving the airport; the operating requirements of the airlines; and local factors such as the proportions of leisure vs. business travelers, locally originating passengers, etc.

Unlike airfield facilities, the capacity of each element of a terminal facility can vary depending on the level of crowding and/or processing time which is considered acceptable. In many cases the degree of acceptability itself may also vary depending on the configuration of the terminal space and the level of amenity provided. Thus, the 'capacity' of a terminal can vary significantly.

The approach taken in developing terminal facilities requirements for COU has been to review the plans and areas of the terminal, make limited observations of passenger activity, and discuss with airport and airline staff how well the present facilities are functioning. These observations - coupled with calculations of area per passenger, per gate, or other determinant of demand - were compared to generally accepted industry planning factors. From these comparisons, a planning factor for each terminal component was determined and used to project facility requirements.

The program areas developed were based on the utilization of existing facilities, and on projected trends as discussed in the previous chapters.

Table 4.4 presents the program data in seven columns:

1) Existing Facilities: These are the areas measured from architectural plans of the terminal, and the current functions as observed.

2) Base Year 2015 Activity: These areas represent the facilities which would be needed to support levels of passenger activity for the base planning year. These values may differ from existing conditions and either point out deficiencies in existing facilities or facilities with excess capacity. These differences help to establish whether existing ratios of space per unit of demand are appropriate to use for planning.

3-7) Recommended Facilities - Planning Activity Levels: These are the areas recommended to support each level of design hour passengers and the associated annual enplanements associated with each Planning Activity Level. The timing of the needed improvements would be based on the actual passenger growth rates.

It should be noted that the terminal space program represents a starting point for terminal planning. It is generally considered a minimum program which is needed to support the design hour levels of passenger activity. As such, it does not refer to any specific terminal concept or gate configuration. When a final terminal concept is chosen, the gross terminal area may differ from the square foot total presented in the tables. For example, the amount of secure and non-secure circulation may vary from the program due to the terminal configuration and location of the security checkpoint, whereas the amount of airline space is relatively independent of the concept selected.

Comparisons between airports, or between alternative concepts, are frequently made on the basis of passengers per gate, or terminal area per gate. But these lack a consistent definition of the term "gate". To standardize the definition of "gate" when evaluating aircraft utilization and requirements, two metrics have been developed: Narrow Body Equivalent Gate (NBEG), which normalizes apron frontage demand based on wingspan, and Equivalent Aircraft (EQA), which normalizes each gate based on seating capacity. Both metrics are further detailed below.

Table 4.4 Airport Terminal Facilities Planning Criteria

Category/Item	**Existing Facilities**	**Recommended Facilities**						**Units**
		2015 Activity	**Planning Activity Level**					
			1	**2**	**3**	**4**	**5**	
Annual Enplanements		65,000	90,000	105,000	120,000	150,000	190,000	
Design Hour Passengers:								
Enplaned Passengers		60	120	140	200	260	280	
Deplaned Passengers		60	60	140	140	200	230	
Total Passengers(1)		120	120	280	220	320	370	
Well-wishers per enplaning passenger		0.2	0.2	0.2	0.2	0.2	0.2	
Meeter/greeters per deplaning passenger		0.4	0.4	0.4	0.4	0.4	0.4	
GATES								
Aircraft Gates:								
Regional (Group II)	2	1	2	1	2	3	2	gates
Regional (Group III)	0	0	0	0	0	0	1	gates
Narrowbody (Group III)	0	0	0	1	1	1	1	gates
Total Gates	2	1	2	2	3	4	4	gates
Total NBEG	1.4	0.7	1.4	1.7	2.4	3.1	3.4	NBEG
Total EQA	1.0	0.5	1.0	1.5	2.0	2.5	2.6	EQA
Additional RON Parking	0	1	0	0	0	0	0	aircraft
Holdrooms:								
Regional (Group II)		1,100	2,200	1,100	2,200	3,300	2,200	SF
Regional (Group III)		0	0	0	0	0	1,400	SF
Narrowbody (Group III)		0	0	2,500	2,500	2,500	2,500	SF
Subtotal Holdrooms	*2,370*	*1,100*	*2,200*	*3,600*	*4,700*	*5,800*	*6,100*	*SF*
AIRLINE SPACE								
Ticketing/Check-in Positions:								
Total Equivalent Positions		3	6	7	10	13	14	pos
Percentage Using Staffed Positions		80%	75%	50%	50%	40%	40%	
Conventional Staffed Positions		2	5	4	5	5	6	pos
Percentage Using Kiosks		20%	25%	50%	50%	60%	60%	
Self Service Kiosks		1	2	4	5	8	8	kiosks
Linear Positions	10	3	6	7	10	13	14	pos
Ticket/Check-in Counter Length	62	20	40	40	60	80	80	LF
Ticket/Check-in Counter Area	448	200	400	400	600	800	800	SF
ATO Offices	422	500	1,000	1,000	1,500	2,000	2,000	SF
Airline Operations	1,327	800	1,500	2,300	3,000	3,800	3,900	SF
Baggage Make-up:								
Estimated Make-up capacity	0	2	3	5	6	8	8	Carts

Table 4.4 Airport Terminal Facilities Planning Criteria

Category/Item	Existing Facilities	Recommended Facilities						Units
		2015 Activity	Planning Activity Level					
			1	2	3	4	5	
Baggage Make-up area	601	900	1,400	2,300	2,700	3,600	3,600	SF
Checked Baggage EDS – units	0	1	1	1	2	2	2	Units
Checked Baggage EDS – area	Incl above	500	500	500	1,000	1,000	1,000	SF
Baggage Claim:								
% of design hr passengers in 20 minutes		100%	100%	60%	60%	60%	60%	
Claim Frontage Required	-	70	70	100	100	140	160	LF
Claim Units	0	1	1	1	1	2	2	Units
Claim Frontage Programmed	42	70	70	120	120	240	240	LF
Claim Area	945	2,100	2,100	3,600	3,600	7,200	7,200	SF
Oversized Baggage	0	100	100	200	200	400	400	SF
Baggage Service Offices/Storage	0	100	100	200	200	300	300	SF
Baggage Claim Off-load Area	219	1,500	1,500	1,500	1,500	3,000	3,000	SF
Baggage Train Circulation	0	200	300	400	400	700	700	SF
Subtotal Airline Space	*3,962*	*6,900*	*8,900*	*12,400*	*14,700*	*22,800*	*22,900*	*SF*
CONCESSIONS								
Secure Concessions:								
Food/Beverage	0	0	0	0	0	0	0	SF
News/Gift/Retail	0	0	0	0	0	0	0	SF
Subtotal Secure Concessions	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*SF*
Non-Secure Concessions:								
Food/Beverage	1,232	500	600	800	900	1,100	1,400	SF
News/Gift/Retail	0	100	200	300	300	400	700	SF
Subtotal Non-Secure Concessions	*1,232*	*600*	*800*	*1,100*	*1,200*	*1,500*	*2,100*	*SF*
Other Services	44	100	100	100	100	200	200	SF
Concession Support Area	303	100	200	200	200	300	400	SF
Rental Car Counter Length	29	30	45	60	60	60	60	LF
Rental Car Lease Area	456	600	900	1,200	1,200	1,200	1,200	SF
Other Leased Areas	175	200	200	200	200	200	200	SF
Ground Transportation Services	0	100	100	100	100	100	100	SF
Subtotal Concessions	*2,210*	*1,700*	*2,300*	*2,900*	*3,000*	*3,500*	*4,200*	*SF*
PUBLIC SPACE								
Ticket Lobby	417	900	1,800	1,800	2,600	3,500	3,500	SF
Public Seating/Waiting Area	555	600	900	1,500	1,700	2,400	2,600	SF
Rental Car Queue Area	143	300	500	600	600	600	600	SF
Restrooms – Terminal Locations	799	1,100	1,100	1,100	1,100	1,100	1,100	SF
Other Public Circulation	2,638	4,100	5,300	6,800	7,800	10,800	11,200	SF

Table 4.4 Airport Terminal Facilities Planning Criteria

Category/Item	Existing Facilities	Recommended Facilities						Units
		2015	Planning Activity Level					
		Activity	1	2	3	4	5	
Subtotal Non-Secure Space	*4,552*	*7,000*	*9,600*	*11,800*	*13,800*	*18,400*	*19,000*	*SF*
Restrooms – Secure Locations	86	1,100	1,100	1,100	1,100	1,100	1,100	SF
Secure Circulation	0	1,200	2,300	2,800	4,000	5,100	5,600	SF
Security Screening Lanes	1	2	2	2	2	3	3	lanes
Checkpoint/search/queue area	792	3,400	3,400	3,400	3,400	5,100	5,100	SF
Subtotal Secure Space	*878*	*5,700*	*6,800*	*7,300*	*8,500*	*11,300*	*11,800*	*SF*
Subtotal Public Space	*5,430*	*12,700*	*16,400*	*19,100*	*22,300*	*29,700*	*30,800*	*SF*
OTHER AREAS								
Information Counter	0	50	50	50	50	50	50	SF
Airport Administration/Operations	1,317	4,500	4,500	4,500	4,500	4,500	4,500	SF
TSA Offices	0	1,100	1,100	1,100	1,400	1,800	1,800	SF
Loading Docks & Receiving	0	500	500	500	500	500	500	SF
Non-Public Circulation	325	1,300	1,500	1,700	2,000	2,500	2,600	SF
Subtotal Other Areas	*1,642*	*7,500*	*7,700*	*7,900*	*8,500*	*9,400*	*9,500*	*SF*
Total Functional Area	**15,614**	**29,900**	**37,500**	**45,900**	**53,200**	**71,200**	**73,500**	**SF**
Mechanical/Electrical/Utility	856	3,000	3,800	4,600	5,300	7,100	7,400	SF
Janitorial/Storage/Shops	365	900	1,100	1,400	1,600	2,100	2,200	SF
Structure/Non-Net Areas	NA	1,000	1,300	1,600	1,800	2,400	2,500	SF
Total Terminal Gross Area	**16,835**	**34,800**	**43,700**	**53,500**	**61,900**	**82,800**	**85,600**	**SF**
Gross Terminal Area per Gate	8,400	34,800	21,900	26,800	20,600	20,700	21,400	SF/gate
Revenue Area (Airlines, Concessions, and Other Tenants)	50.7%	29.6%	32.0%	36.4%	36.8%	39.7%	39.7%	
Non-Revenue Area	49.3%	70.4%	68.0%	63.6%	63.2%	60.3%	60.3%	
ARFF Facilities	1,940	3,400	10,000	10,000	12,000	12,000	12,000	SF

Notes:

(1) Total design hour passengers (enplaned+deplaned) are typically 120% to 160% of deplaned design hour. PAL 1 and 2 total is equal to twice the deplaned design hour due to a single arrival with a short turn time.

- SF-Square Foot; LF-Linear Foot; NBEG-Narrow Body Equivalent Gate; RON-Remain Overnight Parking; EQA-Equivalent Aircraft; ATO-Airline Ticket Office; EDS-Explosive Detection System.

Source: Airports Cooperative Research Program (ACRP) Report 25; Hirsh Associates, 2015; Parsons Brinckerhoff, 2016.

Hirsh Associates has developed a statistic referred to as a Narrow Body Equivalent Gate (NBEG), shown in **Table 4.5**. This statistic is used to normalize the apron frontage demand and capacity to that of a typical narrowbody aircraft gate. The amount of space each aircraft requires is based on the *maximum* wingspan of aircraft in its respective aircraft group. FAA Airplane Design Groups (ADG) used to define runway/taxiway dimensional criteria have been used to classify the aircraft. Group IIIa has been added to more accurately reflect the B757 which has a wider wingspan than ADG III but is substantially less than a typical ADG IV aircraft.

In developing terminal facilities requirements, the apron frontage of the terminal, as expressed in NBEG is a good determinant for some facilities, such as secure circulation. Different terminal concepts can also be more easily to be compared by normalizing different gate mixes.

Table 4.5 Narrow Body Equivalent Gate (NBEG) Index

FAA Airplane Design Group	Maximum Wingspan	Typical Aircraft	NBEG Index
I. Small Regional	< 49 feet	Metro	0.4
II. Medium Regional	< 79 feet	SF 340/CRJ	0.7
III. Narrow Body/Large Regional	< 118 feet	A320/B737/DHC8/E175	1.0
IIIa. Boeing 757(1)	< 125 feet	B757	1.1
IV. Wide Body	< 171 feet	MD-11/B767	1.4
V. Jumbo	< 214 feet	B747,777,787/A330,340	1.8

Notes:

(1) **Group IIIa has been added to more accurately reflect the B757 which has a wider wingspan than ADG III but is substantially less than a typical ADG IV aircraft. Group IIIa is not an official FAA ADG standard included in AC 150/5300-13A.**

Source: ACRP Report 25; Hirsh Associates.

The concept of Equivalent Aircraft (EQA) is similar to that of NBEG, i.e. a way to look at the capacity of a gate. EQA, however, normalizes each gate based on the seating capacity of the aircraft which can be accommodated. In order to have a relationship with the physical parameters associated with the NBEG, the basis of EQA, as shown in **Table 4.6**, is also an ADG III narrowbody jet. Most aircraft in this class typically have 140-150 seats. This establishes a basis of 1.0 EQA = 145 seats. As with the concept of NBEG, smaller aircraft may use a gate, but the EQA capacity is based on the aircraft seating configuration typically in use:

Table 4.6 Equivalent Aircraft (EQA) Index

FAA Airplane Design Group	Typical Seats	Typical Aircraft	EQA Index
I. Small Regional	25	Metro	0.2
II. Medium Regional	50	SF 340/CRJ	0.4
III. Large Regional	90	ATR/DASH 8/E175	0.6
III. Narrow Body	145	A320/B737/MD-80/ATR	1.0
IIIa. Boeing 757(1)	185	B757	1.3
IV. Wide Body	280	MD-11/B767	1.9
V. Jumbo	400	B747,777,787/A330,340	2.8

Notes:

(1) **Group IIIa has been added to more accurately reflect the B757 which has a wider wingspan and higher typical seating capacity than ADG III, but is substantially less than a typical ADG IV aircraft. Group IIIa is not an official FAA ADG standard included in AC 150/5300-13A.**

Source: ACRP Report 25; Hirsh Associates.

While most terminal facility requirements are a function of peak hour passenger volumes, some airline facilities are more closely related to the capacity of the aircraft. Thus, the EQA capacity of the terminal can represent a better indicator of demand for these facilities.

In the following program analysis, peak hour passengers, NBEG and EQA have been used as appropriate to estimate the demand for terminal facilities.

4.3.1 Aircraft Gates and Holdrooms

The number of gates needed to support forecast activity is a critical element in determining the over-all size and configuration of the terminal complex. A "gate" has been defined as an aircraft parking position near the terminal which is used on a daily basis for actively loading and unloading passengers. A gate may have a passenger loading bridge, or be ground loaded.

The existing terminal has two gates. These are currently striped for medium sized RJs (ADG II), but have had service in the past by ADG III aircraft (Frontier Airbus 319/320). Aircraft are currently ground loaded so no loading bridges are used.

Typically, forecasting the number of gates required for each PAL can be done based on annual average passengers per gate, or daily departures per gate. These approaches work well when there are specific operations forecasts for each PAL and when an airport has a relatively consistent pattern of activity. As discussed in Section 4.2, the existing very low number of daily flights and how these operate can affect the design hours and number of gates required to support these levels of activity.

For COU the demand for gates is related to the morning departures peak. For the current activity, the actual demand is for one gate and a second remain-overnight (RON) position since the departures are spaced more than one hour apart. However, as noted in Section 4.2, these could occur within the same hour again as has happened in the past and require two gates with associated hold rooms.

For the PAL programs, all of the morning peak departures are assumed to require active gates with holdrooms.

4.3.1.1 *Gate Mix*

Both aircraft parking positions are walk-out gates. It is the intention of the Airport to provide loading bridges for all gates so as to provide a higher level of service for its passengers, (especially in inclement weather), improve safety by separating passengers from ground service equipment, and to provide more direct access for mobility impaired passengers.

Columbia is considered to be primarily a regional aircraft airport. One full sized narrowbody gate has been assumed beginning in PAL 2 to accommodate Allegiant or similar flights. The remaining gates would be sized for ADG II and III regional jets ranging from 50 to 90 seats.

4.3.1.2 *Remain Overnight (RON) Aircraft Parking*

In addition to active gates, parking may need to be provided for additional RON aircraft. Although not expected to be required until the later PALs (if at all), the number is difficult to quantify given the very low base level of activity. The Program has not specified RON positions, but the terminal apron area should be flexible to expand for RONs should they be required in the future.

As a 2017 update, upon several discussions with the airline partners over the course of the TAMP development, 2 RON positions were requested at the terminal site for the opening day. The airline partners explained that while planned usage of RON positions is not anticipated it is likely that diversions would occur requiring the need for RON positions. Columbia Regional Airport's experience historically has been that occasional diversions are from STL. This historical experience further strengthens the requirement to program for additional aircraft parking positions which should be reflected in the terminal area planning and will be included in the terminal Program.

4.3.1.3 *Holdrooms*

Holdrooms, or Gate Lounges, are based on the mix of gates and the average seating capacity of each class of aircraft. The holdroom area consists of the passenger seating/lounge area; the airline's ticket lift podium; and circulation. The amount of seating/lounge area is dependent on the Level of Service (LOS) which the Airport wishes to provide. The LOS is based on the aircraft load factor, the percentage of passengers seated vs. standing, and the average area per seated or standing passenger.

The current holdrooms consist of two areas. The main holdroom (approximately 1,240 SF) is used for all departures, even if two flights are closely scheduled. The second holdroom (approximately 1,130 SF) is the former bag claim area and, while connected to the main holdroom, is only used occasionally. A new secure restroom has been constructed in the second holdroom, so utilization of this space may increase.

Typically, holdrooms are planned for 80% aircraft loads with 50% of passengers seated and 50% standing. This is considered LOS C, and typically assumes a secure concessions area where many passengers may wait. For COU a higher load factor is recommended (90%) and a ratio of 80% seated and 20% standing (LOS B). The difference in gross area is relatively small for gates primarily serving regional aircraft and would provide a LOS more in keeping with the Airport's current and projected service profile.

A 180 SF (6' wide) deplaning corridor has been added to the lounge area which assumes an average 30' deep holdroom. The corridor effectively acts as an extension of the loading bridge or apron door. Each ticket lift podium position is allocated 5' for width, although many airlines use 3-4' wide positions. The depth of the podium and back wall is typically 8' and a 15' deep queuing area is provided.

The average aircraft seating capacities and holdroom sizes are:

	Seats	Area (SF)
Regional - ADG II	65	1,100
Regional - ADG III	90	1,400
Narrowbody	170	2,500

The narrowbody holdroom is sized to reflect average seating in Allegiant's aircraft.

The current amount of holdroom area meets the requirements for the 65 seat and smaller aircraft currently serving COU. However, the two holdrooms need to have a better connection to function as a consolidated space. In the longer term, the existing holdrooms would be undersized once 90 seat aircraft are introduced or Allegiant begins service.

4.3.2 Airline Space

Airline space includes both exclusive leased areas (for example offices and operations), and joint use space (such as baggage claims). The airline serving COU was contacted to determine how well the terminal was functioning, and requested to provide estimates of future facilities.

At COU, there are two airline areas. Each includes a check-in counter, office/operations space, and baggage make-up area. The north area is used by American. The south area is currently vacant.

Each airline area is configured differently, and functions such as airline offices and operations are not easily distinguished in some cases. On other cases, vacant space is used for unplanned functions. For example, the baggage make-up space for the south ATO is used for storage but included in the Program as existing baggage make-up to show the terminal's potential capacity. Recommended facilities for each function have been developed separately.

4.3.2.1 *Airline Ticketing/Check-in Counter (ATO Counter)*

The airline ticket office (ATO) counter traditionally has consisted of staffed agent positions. As airlines provide more self-service kiosks, the definition and configuration of check-in function has, and will continue to change. In order to estimate future ATO requirements, staffed positions and kiosks were combined as Total Equivalent Check-in Positions (ECP).

Ticketing/check-in positions are typically based on the number of peak hour enplaning passengers; the number of peak departing flights; the number of airlines; the time distribution of passengers arriving at the terminal; and the percentage of passengers checking in at the ticket counter vs. curbside check-in or using a self-service kiosk. A planning factor was developed which is primarily based on current ATO counter utilization (not necessarily leased positions), and available passenger characteristics as described below

The existing airline (AA) is using two conventional staffed ATO counters and one electronic self-service kiosk which can only be used for passengers with carry-on bags. Thus, the current ECP demand is 3 ECP. There are an additional eight potential check-in positions which are presently vacant (6 at the south airline counter and 2 at the north counter). The current ratio of Design Hour Enplaned Passengers per ECP (20 passengers per ECP) was held constant for the forecast years and applied to the forecast passengers.

From the number of kiosks in use, and discussion with AA, it is assumed that 80% of the passengers currently use conventional check-in counters, and that only 20% use kiosks or check-in off-site. Based on industry trends, the percentage of kiosk use is expected to increase in the future to between 50 and 60%. This assumes that both AA and any additional airlines will make the investment in kiosks at COU. The percentage of passengers who check-in off-site and do not have checked bags (thus able to bypass the check-in lobby) is not known. Given the small base of activity, these have been included in the kiosk user percentage.

The number of forecast ECPs was converted to conventional linear positions to establish the length of the ATO counter. Locations for kiosks are a combination of airline preference and the physical constraints of the ticket lobby. At present, the single kiosk is adjacent to the ATO counter and takes up what could be a conventional position. For COU it has been assumed that future kiosks would be located in-line with the staffed counters.

Most domestic carriers can use a 6' double counter plus a shared 30" bag well for an average of 4.25' per agent. There are also breaks in the ATO counter to allow personnel access to individual ATO office areas, and end counters typically without bag wells. This increases the average ATO counter length for planning to typically 5.5 LF per position for longer counters. The existing ATO counters average 6 LF per position. For planning, a ratio of 6 LF per position has been assumed. The width of an in-line kiosk can be less than that of a staffed counter, but is highly dependent on individual airlines' equipment. For planning, all in-line positions are assumed to require the same width.

The ATO counter depth is typically 10' from face of counter to back wall for domestic terminals to provide space for the counter, agent work space, and a baggage conveyor parallel to the counter. The existing counter depths are approximately 9' without baggage conveyors. Bags are carried from the counter bag well to a ‘doggie’ door and slid into the baggage screening and make-up area.

For planning, a conventional 10' deep counter area has been assumed. Area for checked baggage screening has been estimated separately to allow for different checked baggage screening options in the future. See Section 4.3.2.5 below.

4.3.2.2 *Airline Offices*

Airline Offices include the ATO offices and other airline administrative spaces. At most airports the ATO offices are located immediately behind, or adjacent to the ATO counter to provide support functions for the ticket agents. Typically, these are 25-30' deep along the length of the counter. Other offices may include functions such as the airline station manager. The amount of these offices and location (ATO, operations area, office location on a terminal upper level, etc.) is dependent on individual airline requirements and preferences, and space availability.

As noted previously, all offices are located directly behind the ATO counter and include airline operations spaces. For the Program, a 25' deep office area has been assumed behind the ATO counter. Operations spaces are estimated separately.

4.3.2.3 *Airline Operations*

Operations include all of the support spaces for aircraft servicing, and aircraft crew related support spaces. The demand for operations areas is a function of the size and types of aircraft being operated and individual airline operating policies. Because many airlines do not identify their specific space requirements at this stage of planning and future airlines cannot be identified, a program area for operations is typically based on the number/size of gates and airlines at an airport. Also, note that a large airside storage area next to the south counter zone has been included in the airline operations area although presently used by the Airport.

At present, approximately 870 SF of combined offices and operations spaces behind the ATO counters are leased. The presence of personnel lockers and other types of storage in the baggage make-up area indicates that operations areas may be undersized for current airline operations. For planning, a slightly higher, more typical small airport ratio of operations space per gate (EQA) has been assumed.

4.3.2.4 *Baggage Make-up*

Baggage make-up includes the make-up units or conveyors, the cart loading areas and baggage tug/cart (baggage train) maneuvering. Each of the make-up areas could accommodate a single bag cart, which has to be positioned by hand.

For an airport like COU which serves primarily smaller regional aircraft, the number of carts is typically one or two for each flight depending on the season. It was reported that with the current 65 seat aircraft, two carts are needed at times during the winter. Two cart positions for each flight have been assumed with the morning departure peaks defining the number of flights expected in the make-up process. The program area would be able to accommodate bag make-up conveyors for both carts staged inside with increased space for cart maneuvering. This amount of space could also accommodate some overnight inside parking for sensitive ground service equipment.

4.3.2.5 *Checked Baggage Screening*

As a result of the Aviation and Transportation Security Act, all checked baggage is subject to screening for explosives. At present, checked baggage screening is performed by explosives trace detection (ETD) and bags are handled manually. According to the TSA, other types of screening equipment have been considered, but there is insufficient space to locate this.

It has been assumed that CT-80 (or similar) explosive detection systems (EDS) located behind the check-in counters would be used in the future. These would have direct feeds from the ATO counter, and to the baggage make-up belt. Each CT-80 also requires a separate inspection table and associated explosives trace detection (ETD) unit for bags that alarm in the EDS unit. This arrangement is simple in configuration but requires significantly more space than the current manual ETD procedures.

Based on discussions with AA and TSA, there is an average of 0.8 checked bags per passenger during the peak months. Each EDS unit has the capacity to process 130 bags/hour based on current generation equipment. The program area for each unit assumes a dedicated EDS for a group of check-in counters and bag drops. Redundant units have not been planned, which assumes that in the event of EDS equipment failure, manual ETD inspection would be used.

4.3.2.6 *Baggage Claim*

Baggage claim requirements are based primarily on design hour deplaned passengers, the concentration of these arriving passengers within a 20 minute time period, and - to a lesser extent - checked bag per passenger ratios. Observations at most U.S. airports indicate that the majority of domestic passengers arrive at the baggage claim area before their bags are unloaded onto the claim units. At an airport such as COU, virtually 100% of the passengers are waiting prior to first bag delivery. The result is that the claim unit should be sized for the estimated number of passengers waiting for baggage, because most bags are claimed on the first revolution of the claim unit.

The current schedule and assumed activity in PAL 1 has one arrival in the design hour. Thus, 100% of the design hour activity occurs in 20 minutes. In later PALs when there are estimated to be two or three arrivals, these would likely be spread out, but could still overlap due to daily arrival time variations. Based on other airports, it is estimated that the peak 20 minutes could represent 60% of the design hour activity. The percentage of passengers who have checked baggage is estimated at 80% during the peak months.

The baggage claim unit has approximately 40 linear feet of claim frontage. This is considered undersized for 65 seat regional jets. For the longer term, larger (120 linear foot) claim units are recommended to be able to accommodate overlapping flight arrivals by regional jets, especially as their seating capacity grows. This would also be more suitable for narrowbody aircraft with more typical checked bag ratios. The baggage claim area is recommended to be 30 SF per foot of frontage to provide adequate queuing and circulation space with flat plate claim units. When multiple claim units are required a 30' separation between adjacent claim units is recommended.

An allowance for oversized baggage delivery has been included. This would be for an oversized baggage slide of adequate size for skis and other large checked items.

4.3.2.7 *Baggage Service Offices*

Baggage service offices are typically required only by airlines with sufficient activity to warrant staffing. Other airlines may use baggage lock-up areas to store late or unclaimed baggage. All late bags are presently stored in the ATO offices. Discussions indicate that baggage storage lockers or a storage room would be desirable.

4.3.2.8 *Baggage Claim Off-load*

Baggage off-load includes: the portion of a flat plate, direct feed claim unit upon which the bags are placed; the adjacent baggage train lane and work area; and a by-pass lane for baggage trains. The existing area in the table only includes the non-accessible portion of the claim unit and not the off-load work area which is outside the terminal building. There is a relatively narrow roll-up door to access the back of the claim unit.

The program area assumes that the off-load areas would be enclosed with adequate unloading frontage (2 carts) for each claim unit.

4.3.2.9 *Baggage Train Circulation*

A percentage of baggage handling space for baggage train circulation around and between the bag make-up and off-load areas is included for planning. Ten percent has been included but the final configuration of the terminal may require more or less space.

4.3.3 Concessions

Terminal Concessions include all of the commercial, revenue-producing functions which serve the traveling public. At the present time, all of the food/beverage and retail merchandise concessions are located in the non-secure area of the terminal.

4.3.3.1 *Food Services and Retail*

These categories include food and beverage concessions and news/gift/retail shops. Planning ratios for these facilities are based on preliminary sales projections developed for comparable airport concession programs, market characteristics in the Columbia region, and enplanement projections.

4.3.3.2 *Other Services*

This category usually includes ATMs, vending, arcades, and other services. The terminal has one small vending area near the baggage claim.

4.3.3.3 *Concession Support*

Concession support consists of storage areas, preparation kitchens, employee lockers and administrative offices.

4.3.3.4 *Rental Car Counters*

There are two rental car (RAC) brands operating on airport. Enterprise and Hertz share the counter, but only Hertz has an office in the terminal. Hertz also has a second office for their franchise office. Based on discussions with the Airport, there is interest from Budget to locate on-airport. Avis also serves the airport, but delivers cars from their downtown location. The length of the RAC counters has been increased in the future to accommodate three to four companies.

Based on typical RAC counters and offices at small airports, the area for counters and adjacent offices has been estimated at 20 SF per foot of counter. The Hertz franchise office has been separated as other leased space, assuming they continue to have this function in the terminal.

4.3.3.5 *Ground Transportation Services*

There are no permanent counters for ground transportation services, other than a hotel/information board. For planning, it is recommended that space be provided for other transportation services in the future.

4.3.4 Public Spaces

Public spaces include most of the non-revenue producing areas of the terminal including queuing areas, seating and waiting areas, restrooms, and circulation. Some of the public space elements are directly related to peak hour passenger volumes, whereas others are functions of other facility requirements.

4.3.4.1 *Ticket Lobby*

The ticket lobby includes ticket counter (ATO) queuing area, self-service kiosks, and cross circulation. The current terminal is severely constrained in this area. The passenger queue, and cross circulation at the AA counter is less than 18' including a row of seats. The total queue and circulation in front of the vacant south counter is only 12' to the opposite wall. The result is that AA passengers queue down the hall in front of the checkpoint entrance.

The minimum dimension from the face of the ticket counter to any obstruction to cross circulation should be 30-35' for airports with traffic similar to COU. Although the trend toward increased self-service check-in has led some in the industry to predict the extinction of ticket lobbies, thus far airlines are using ticket lobbies for different configurations of kiosks and baggage drop counters. Thus, a 35' deep lobby is recommended to retain future flexibility.

4.3.4.2 *Public Seating*

Public seating areas include general waiting areas near the ticket lobby, baggage claim areas and concessions. These are typically in non-secure areas of the terminal. The seating areas in the terminal are presently across from the security checkpoint, along the main corridor near check-in, and outside of bag claim.

Airports typically provided seating for a portion of the peak hour enplaned passengers and their visitors, plus the greeters for the deplaning passengers. Due to security restrictions, the number of well-wishers at most airports have declined dramatically and these ratios are estimated to be low at COU.

For terminal programming, it has been assumed that non-secure seating would be provided for 25% of design hour enplaned passengers and their visitors, plus all of the meeter/greeters of deplaning design hour passengers. This higher than typical percentage is due to the times that the security checkpoint is open (see Section 4.3.4.6) and the location of all concessions outside of security. The seating would be located to provide an area prior to security near the concessions for departing passengers and for meeter/greeters outside of security or near the baggage claim.

4.3.4.3 *Rental Car Queue*

The existing rental car customer queuing and circulation is less than 9 feet from the counter to the checkpoint wall. This results in passenger queues extending into the main terminal corridor and crossing the checkpoint queue during the afternoon on busy days. It is recommended that a 10 foot deep queue area in front of the RAC counters be planned plus cross circulation dependent on configuration. This is considered adequate for the volume of customers at airports of the size of COU.

4.3.4.4 *Restrooms*

Restrooms should have at least as many toilets for women as toilets and/or urinals for men. In some jurisdictions, new building codes are mandating 25% to 50% more fixtures for women than for men.

With the exception of a new single person, unisex restroom in the holdroom, the restrooms are in the non-secure portion of the terminal. The men's restroom has 3 urinals and 3 toilets, while the women's restroom has 4 toilets. Thus, the fixture ratio is the opposite of what airports should provide. There is an additional handicapped restroom for each sex, but an independent terminal accessibility survey conducted in 2012 indicates that there are issues with each of these as well.

The program area has been divided between the main terminal locations (ticketing, and bag claim) and the secure holdroom area. The terminal factor is based on peak hour total passengers and their estimated visitors. The holdroom factor is based on providing a restroom appropriate to the size of the aircraft gates and is sized for arriving passenger volumes. Because the main demand on secure restrooms is for arriving passengers, it is recommended that these be located to be convenient for passengers proceeding from gate to baggage claim. This is based on the assumption that deplaning passengers would flow through the holdroom area before exiting the secure side of the terminal.

The minimum number of toilets and/or urinals is recommended to be 4 for men and 5 for women in both locations.

In addition to handicapped access toilets, sinks and urinals, it is recommended that companion care/family restrooms be provided. These unisex restrooms allow an elderly or disabled person to be accompanied into a restroom by another person who assists the disabled person. These can also be used by a parent with a small child where it may not be appropriate to use the main restroom. The program restroom area includes a companion care restroom for each restroom module, and a janitor closet. There are no companion care restrooms in the terminal at present.

4.3.4.5 *Secure Circulation*

Secure circulation typically consists of the central corridor of the concourses and adjacent egress stairs (if not at ground level). The existing terminal has no secure circulation as typically defined.

Although the Program is not based on a specific concept, a replacement terminal would likely have a single-loaded concourse, or a central consolidated holdroom. Terminal planning practice would recommend a 15-20' wide corridor for single-loaded concourses handling aircraft of the size range expected long term at COU depending on whether there are significant uses across from the holdrooms and the number of gates. Ancillary uses would be located outside of these corridors. A planning factor based on a 15' wide corridor was used.

The program area is based on an area per equivalent concourse length determined by gates expressed as NBEG. The actual amount of secure circulation required will depend on the terminal configuration.

4.3.4.6 *Security Screening Checkpoint (SSCP)*

With the changes in security inspection procedures, processing rates have been greatly reduced at most airports. The TSA has also mandated new security screening checkpoint (SSCP) configurations. The existing SSCP is extremely deficient in terms of both screening equipment and passenger queuing:

- There is a single walk-through metal detector (WTMD) and hand bag X-ray with no back-up equipment. If there is a failure, hand searches are conducted which slows the process considerably. There is no space to expand the checkpoint.
- The queue for the SSCP can mix with both passengers checking in at the ATO, and with RAC customers causing congestion and confusion. Due to the limited queue space and lack of services in the holdroom, experienced passengers tend to wait in the various seating areas until the queue has dissipated before going through security.
- Due to the limited capacity of the SSCP and the holdroom, the checkpoint opens 1 hour before scheduled departure times.

With constantly changing TSA procedures, potential introduction of advanced imaging technology (AIT) scanners, and limited observations of processing, a throughput rate of 120 passengers/lane/hour has been used. This would not require a second lane until PAL 2, however, a minimum of two lanes is recommended to provide back-up equipment.

The program area includes the actual SSCP equipment, divesting/bag repacking areas and TSA support space that is required at the checkpoint. This can vary by equipment configuration. Current TSA configurations require up to 65' by 30' wide (per pair of lanes) for the equipment plus additional space for document checking and passengers to re-pack their carry-ons. The program has assumed an 85' deep zone to accommodate all these functions. Additional area for TSA support at the SSCP (5%) has been included. The queuing area has been sized for a 15 minute maximum wait, or 25' deep.

Space for a 2 to 3 lane SSCP will be accommodated in the alternatives development in Chapter 5. However, existing and future processing rates at the SSCP is primarily a function of the type of equipment installed at the checkpoint and checkpoint staffing levels which are solely at the discretion of the TSA, and not the FAA or the City of Columbia.

4.3.4.7 *General Public Circulation*

Other public circulation includes the corridors, vertical circulation elements, and other architectural spaces which tie the public functional elements of the terminal together. The program area is based on a percentage of these functional areas: baggage claim, baggage service offices, holdrooms, concessions (excluding concession support area), and other public areas. The percentage is a first approximation and will also vary with the terminal configuration. The split between secure and non-secure (public) circulation is also a function of the terminal concept, however in the table the public circulation allowance has been included as non-secure circulation.

The existing terminal is primarily a single level facility with only a restaurant/bar and airport offices on a second level (in separate areas). There are no elevators to either location and this has limited the accessibility of the restaurant both for passengers who cannot use stairs, but also for those with larger carry-on bags. If the replacement terminal has a second level, elevators will be required for those areas intended to be accessible to the public.

4.3.5 Other Areas

4.3.5.1 *Information Counter*

A small area for a potentially (volunteer) staffed information counter and larger display area has been included in the program.

4.3.5.2 *Airport Administration/Operations Offices*

Airport operations and public safety offices are located adjacent to the ARFF garage with administrative offices located above. Airport personnel are cross trained for operations, ARFF and public safety so a terminal location with public access is preferred. An emergency operations center (EOC) has been requested that could also function as a conference/meeting space. This would also need to be ADA compliant.

The current combined administration and operations offices are considered undersized but a formal definition of required spaces has not been developed by the Airport. Based on other small terminals studied by the Consultant, the amount of administration/operations space has varied from less than 2,000 SF to 9,000 SF as compared to 1,320 SF at COU. A preliminary estimate of 4,500 SF has been included in the program subject to refinement by the Airport.

The existing ARFF equipment bays can accommodate the two ARFF vehicles (airport index B), but the garage is narrow and newer equipment has a very tight fit. The existing vehicle bays are 13.5 feet wide, and the largest ARFF vehicle at the Airport has only a few inches of clearance. The program has included a 3 bay ARFF garage with related office and support spaces to maintain a consistent comparison to the existing terminal. The third vehicle bay would serve to support rapid re-servicing of ARFF vehicles. Whether an ARFF garage will be part of a replacement terminal will be determined based on response time requirements and terminal location.

4.3.5.3 *Transportation Security Administration (TSA) Offices*

In addition to the passenger and baggage screening equipment and adjacent search areas, the TSA occupies space for general offices, training, agent break room, and storage. This is presently located next to the terminal in the former FAA flight services station building.

The terminal program for TSA space is limited to that needed to support the SSCP and checked baggage screening operations. It is assumed that this would be located in a replacement terminal due to the distance to the existing FAA building.

4.3.5.4 *Loading Docks*

The terminal will require a loading dock and receiving area to allow deliveries from the public roadway system, as well as removal of trash generated by terminal users. If there will be secure side concessions, the TSA requires screening of deliveries before these are moved into or through secure areas.

4.3.5.5 *Non-Public Circulation*

Non-public circulation provides access to airline operations, airport administration areas, concession support, and other areas typically not used by the traveling public, as well as restrooms used by airport tenants.

Non-public circulation also includes elevators for concessions servicing if the loading dock and storage areas are located on different levels. These should be sized and rated for freight of the type required by the various concessions. Non-public circulation should be located so as to provide delivery and trash removal to as many concessions as possible without requiring passage through public spaces. The program area is based on 12% of non-public functional areas, and includes area for employee restrooms.

Evolving security protocols may also require screening checkpoints for employees which could increase the amount of non-public circulation beyond these percentages.

4.3.5.6 *Mechanical/Electrical/Utility*

At the planning and programming stage, utilities areas are typically estimated as a percentage of the enclosed functional areas of a terminal. This will vary with the provision of central plant functions either within the terminal or remotely; and, in some cases, architectural design considerations which may limit the use of roof-top equipment, etc. Most newer terminals are in the range of 10-12% of functional areas, when the terminal has its own heating/cooling plant.

The existing terminal mechanical/electrical systems are equal to less than 5% of the functional area of the terminal. For planning, a factor of 10% of functional areas has been used.

4.3.5.7 *Janitorial/Storage/Shops*

Janitorial, storage and shop space include the building maintenance functions which are required to be within the terminal building. In addition to typical janitorial functions, space must be made available to store any specialized maintenance equipment for the terminal, such as lifts for high ceiling areas.

At COU, maintenance and storage areas are located in multiple locations in the terminal, and occupy some space originally intended for airline operations. The existing over-all ratio of these spaces to the functional areas (2.1%) has been increased to 3% for planning.

4.3.5.8 *Structure/Non-net areas*

Non-net areas are added to the recommended facility requirements to provide a better estimate of the total gross building footprint. Although the program areas are in terms of gross space, allowances must be made for exterior walls. It is also to be expected that buildings will have areas that are unusable, or occupied by special structures. For planning, a 3% factor has been used which is typical of terminals with conventional designs.

4.3.6 Terminal Building Requirements Summary

The total gross terminal area including all of the elements described previously, with the exception of the ARFF facilities, is summarized in **Table 4.7** for each Planning Activity Level**.**

Table 4.7 Total Gross Terminal Requirements

PAL	Gates	Area (SF)
Existing (2014)	2	16,835
2015 Activity	2	34,800
1	2	43,700
2	2	53,500
3	3	61,900
4	4	82,800
5	4	85,600

Source: Hirsh Associates

4.4 Ground Transportation Facility Requirements

4.4.1 Public Parking

The Airport has three public parking lots with a total of 554 parking spaces. Daily parking occupancy counts were obtained from Airport staff for August and September 2015. During the two month period, parking counts averaged between 332 and 339 vehicles. Activity peaked at 404 vehicles in early August. August enplanements at COU in 2015 were approximately 90 percent of peak monthly activity year-to-date in April 2015. Therefore, actual peak vehicle parking occupancy is estimated to be 449 vehicles. This peak occupancy number is assumed to represent overnight occupancy at COU. Actual peak occupancy would typically occur during the day after the departures peak in the early morning, and before the first arrivals in the early afternoon. To account for this additional accumulation, the overnight occupancy was increased by 15 percent, resulting in a peak month daily demand of 516 spaces. This is consistent with discussions with Airport staff that parking was operating at or near capacity during the March/April timeframe in 2015.

Public parking demand is typically forecast based on annual enplanements, using a planning factor for spaces per million or thousand annual enplanements. For COU, annual enplanement activity in 2015 reached 64,300 enplanements. This results in a planning ratio of 8 spaces per thousand annual enplanements.

Table 4.8 summarizes the results of the public parking facility requirements analysis. To allow for flexibility and to provide enough open spaces for circulating vehicles to find an empty space, parking facilities are considered at capacity when demand reaches 90 percent utilization. Projected demand for each planning level has been increased by 10 percent to account for the effective supply of parking spaces to determine the surplus or deficit within the parking system.

Table 4.8 Public Parking Facility Requirements

Planning Activity Level	Annual Enplanements	Demand[(1)]	Supply	Surplus / Deficit
2015 Activity	64,300	580	554	-26
1	90,000	800	554	-246
2	105,000	930	554	-376
3	120,000	1,070	554	-516
4	150,000	1,330	554	-776
5	190,000	1,690	554	-1,136

Notes:
(1) **Parking demand includes 90% utilization rate for effective supply. Demand values rounded to nearest 10 vehicles.**

Source: ES&S Inc., Parsons Brinckerhoff, 2015.

During peak month conditions, there is currently a slight deficit in parking spaces at COU. This deficit is projected to increase to just over 500 spaces by the end of PAL 3, and over 1,100 spaces at the end of PAL 5.

4.4.2 Access Roadways

Future vehicular traffic projections for Route H and Airport Drive were developed to evaluate future roadway needs. Existing traffic on Route H warrants a dedicated right turn lane for eastbound Route H to Airport Road.

A review of projected volumes and delays indicate that a traffic signal or roundabout may be required by PAL 3 at the intersection of Route H and the Airport access road.

As passenger enplanements continue to increase, the two-way section of Operations Drive at the terminal exit should be reconfigured to permit one-way traffic flow only.

4.4.3 Terminal Curb front

The Airport has one terminal curb front area consisting of two traffic lanes. The existing curb front length is approximately 300 feet long, with an effective length (accounting for maneuvering areas and pedestrian crosswalks where vehicles are not allowed park) of approximately 260 feet on the inner lane.

Utilizing the Airport Cooperative Research Program’s (ACRP) *Airport Passenger Terminal Planning and Design* spreadsheet modeling tool for curb requirements, estimates for terminal curb front requirements can be determined. A peak hour flow rate for vehicular curb front traffic (including personal vehicles, taxi, shuttles, and transit) was estimated based on observations of existing curb front use and discussions with Airport staff. Additional assumptions regarding vehicle dwell times by classification type and vehicle occupancy rates were applied based on industry standard ranges.

Table 4.9 presents the terminal curb front requirements throughout the planning period. The existing terminal curb front length would be sufficient to meet anticipated peak hour demands through PAL 3. Demand levels at PAL 4 and PAL 5 would require a longer curb front. This is based on most airport users (up to 72 percent) parking in one of the free parking lots or using rental car facilities on-site. These values would fluctuate based on availability of public transportation at the Airport (whether through public agency bus systems or hotel shuttles) and whether a charge for usage of the parking facilities is implemented in the future.

Table 4.9 Terminal Curb Front Requirements

		Planning Activity Level				
	2015	**1**	**2**	**3**	**4**	**5**
Annual Enplanements	65,000	90,000	105,000	120,000	150,000	190,000
Curb Front Required(1)						

Departures Curb front (ft)	30	50	70	90	110	120
Arrivals Curb front (ft)	20	20	60	60	80	90
Total Curb front (ft)	***50***	***70***	***130***	***150***	***190***	***210***
Existing Geometry (ft)	260	260	260	260	260	260

Notes:
(1) Values rounded to nearest 10 feet

Source: ES&S, Inc, Parsons Brinckerhoff analysis, 2015.

A minimum of three lanes at the terminal curb front is recommended, with a fourth lane being recommended as activity levels increase. Three lane terminal curb fronts may develop congestion and increase vehicular delays when double parking is allowed on the inner two lanes, potentially restricting traffic flow on the outer through lane.

Through PAL 3, it is recommended that a three-lane curb front section be implemented. Based on how curb front usage changes at COU at the higher PAL 4 and PAL 5 demand levels, a fourth lane for additional through traffic circulation should be anticipated.

A separate commercial vehicle (taxis and hotel shuttles) curb area should also be considered during the alternatives development stage if it is anticipated that at higher demand levels the high percentage usage of taxis that exists today continues.

4.4.4 Rental Car Parking

The rental car ready/return lot consisting of 58 spaces is located south of the main terminal building. Two rental car companies currently supply vehicles at the Airport. While Hertz has a small car wash/turnaround area along Airport Drive south of the terminal area, Enterprise currently uses an off-airport facility to stage their vehicles, using the Airport rental car lot when vehicles are needed at the Airport.

Rental car parking needs are also expected to grow at the same rate as enplanement growth at the Airport. **Table 4.10** summarizes rental car ready/return lot demand through the planning period. Additional space for quick turn-around (QTA) needs should be considered during the alternatives development for fueling, light maintenance and additional short-term storage needs for rental car companies as enplanements reach PAL 3 levels and higher.

Table 4.10 Rental Car Ready/Return Parking Facility Requirements

Planning Activity Level	Annual Enplanements	Demand	Supply	Surplus / Deficit
Existing (2014)	56,000	49	58	9
2015	64,300	63	58	-5
1	90,000	88	58	-30
2	105,000	102	58	-44
3	120,000	116	58	-58
4	150,000	146	58	-88
5	190,000	185	58	-127

Source: ES&S, Inc., Parsons Brinckerhoff, 2015.

4.5 Facility Requirements Summary

This chapter outlined COU's terminal facility needs for anticipated passenger activity levels based on the aviation activity forecasts developed in Chapter 3. The facility requirements determined in this chapter will serve as the basis of the alternatives developed in Chapter 5.

Several areas within the existing terminal building are not adequate to meet current (2015) needs, such as the baggage make-up, the security screening checkpoint, rental car counters and queue areas, public circulation space, vehicular parking facilities, and operations, administration, and ARFF space. As passenger activity increases, other areas of the terminal will begin to experience increased congestion above most passengers' level of comfort.

An expansion or replacement of the passenger terminal is recommended to accommodate existing and anticipated future passenger activity based on the analysis included in this chapter. The Alternatives chapter will explore potential improvements to the terminal area facilities to meet forecast demands through the planning period.

5 ALTERNATIVES ANALYSIS

This chapter documents the alternatives analysis portion of the terminal area master plan for Columbia Regional Airport. The objective is to identify a set of alternatives and select a preferred alternative that will accommodate the terminal area needs at COU over the 20-year planning period. These needs are based upon the FAA approved forecast and described in detail in Chapter 4 of the terminal area master plan. The alternative analysis element of the terminal area master plan includes five primary tasks:

- Identification of Alternatives
- Preliminary Screening
- Shortlist Alternatives
- Secondary Screening
- Recommendation of Preferred Alternative

A summary of the needs that are to be addressed in this TAMP include: 1) a terminal facility that can accommodate the anticipated passenger enplanements; and 2) a modern facility that can be safely, efficiently, and economically constructed, operated and maintained.

5.1 Identification of Alternatives

Six general land use alternatives were developed to identify areas around the Airport that could support the projected long term terminal facilities and operations. The specifics of each alternative are identified in the following subsections.

5.1.1 Alternative 1: Existing Site

Alternative 1, shown in **Exhibit 5.1**, assumes a redevelopment of the existing terminal site to meet the terminal program needs outlined in Chapter 4. This alternative includes all the areas currently utilized by the existing terminal and associated vehicle parking areas as well as the potential use of some adjacent areas for use in meeting the terminal program needs. The adjacent areas include buildings, a navigational feature (airport beacon), hangars, parking areas and apron areas currently being used for both aeronautical and non-aeronautical usages as well as the associated parking lots for these buildings. Should it become necessary to expand this site into the adjacent areas to meet the program needs, their relocation would be part of this site's development requirements.

Exhibit 5.1A and 5.1B illustrate the planned locations for future general aviation (GA) hangar development. Development of the terminal program at Alternative 1: Existing Site does not have an impact on the location of future GA hangar development, but, in fact, can be maintained as proposed in the 2009 conditionally approved Airport Layout Plan (ALP).

Both aircraft and vehicular access to the terminal site would remain the same as existing.

5.1.2 Alternative 2: Northwest Airfield

Alternative 2, shown in **Exhibit 5.2**, assumes a relocation of all passenger terminal operations and functions to an area north of Runway 13-31, west of Runway 2-20, and south of Route H.

The existing terminal area would be redeveloped into additional general aviation use and/or for charter operations.

Aircraft access to the new terminal site would require a new partial parallel taxiway (Group III width of 50-ft, from Runway 2-20 to the end of Runway 13), an upgrade to the existing partial parallel Taxiway B (soon to be renamed to Taxiway C, currently a Group II design at 35-ft wide, to a future Group III at 50-ft wide), and taxilanes from the new apron to access the airfield. Vehicular access would be provided through a new access road off of Route H. An extension of the perimeter access road (airport operations service road) inside the fence would also be part of this site's development program.

5.1.3 Alternative 3: East Airfield

Alternative 3 relocates all passenger terminal operations and functions to the east side of Runway 2-20 in the vicinity of the existing ATCT, as shown in **Exhibit 5.3**. The existing terminal area would be redeveloped into additional general aviation use and/or for charter operations.

Aircraft access to the new terminal site would require a new taxiway and taxilane access to Runway 2-20 and to Taxiway B (soon to be renamed Taxiway C) for access to Runway 13-31. This alternative assumes vehicular access to the terminal area via Rangeline Road in its ultimate configuration after the extension to Runway 13-31. As the majority of passengers who would use the terminal come from the south, relocation of the terminal to this site would increase the travel distance of most passengers by almost 1.5 miles.

This alternative's development envelop is restricted by the existing property boundary as well as by a large wooded drainage feature (potential wetland) immediately to the south of the ATCT. Development around the ATCT may be severely restricted as well in order to not impact the line-of-sight from the tower to the rest of the airfield (by a new terminal or new aircraft parking positions).

5.1.4 Alternative 4: USPS Facility

Alternative 4, shown in **Exhibit 5.4**, involves a redevelopment of the existing terminal site and areas south along the Runway 2-20 flight line to meet the terminal program needs. This alternative would involve the re-use of the existing US Postal Service (USPS) facility into a passenger terminal building. Two GA hangars and the FAA flight service station would be displaced in this alternative and would require relocation elsewhere on airport property.

Both aircraft and vehicular access to the terminal site would remain similar to existing, via Taxiway A and Airport Drive, respectively.

5.1.5 Alternative 5: Southwest Airfield

Alternative 5, shown in **Exhibit 5.5**, assumes a relocation of all passenger terminal operations and functions to an area west of Runway 2-20, and south of existing GA development along Taxiway A. The existing terminal area would be redeveloped into additional general aviation use and/or for charter operations. This area was identified as a future General Aviation development area as part of the last Master Plan, which would need to have an alternate location identified for this scenario.

Aircraft access to the new terminal site would occur off of existing Taxiway A. Vehicular access would be provided via Airport Drive.

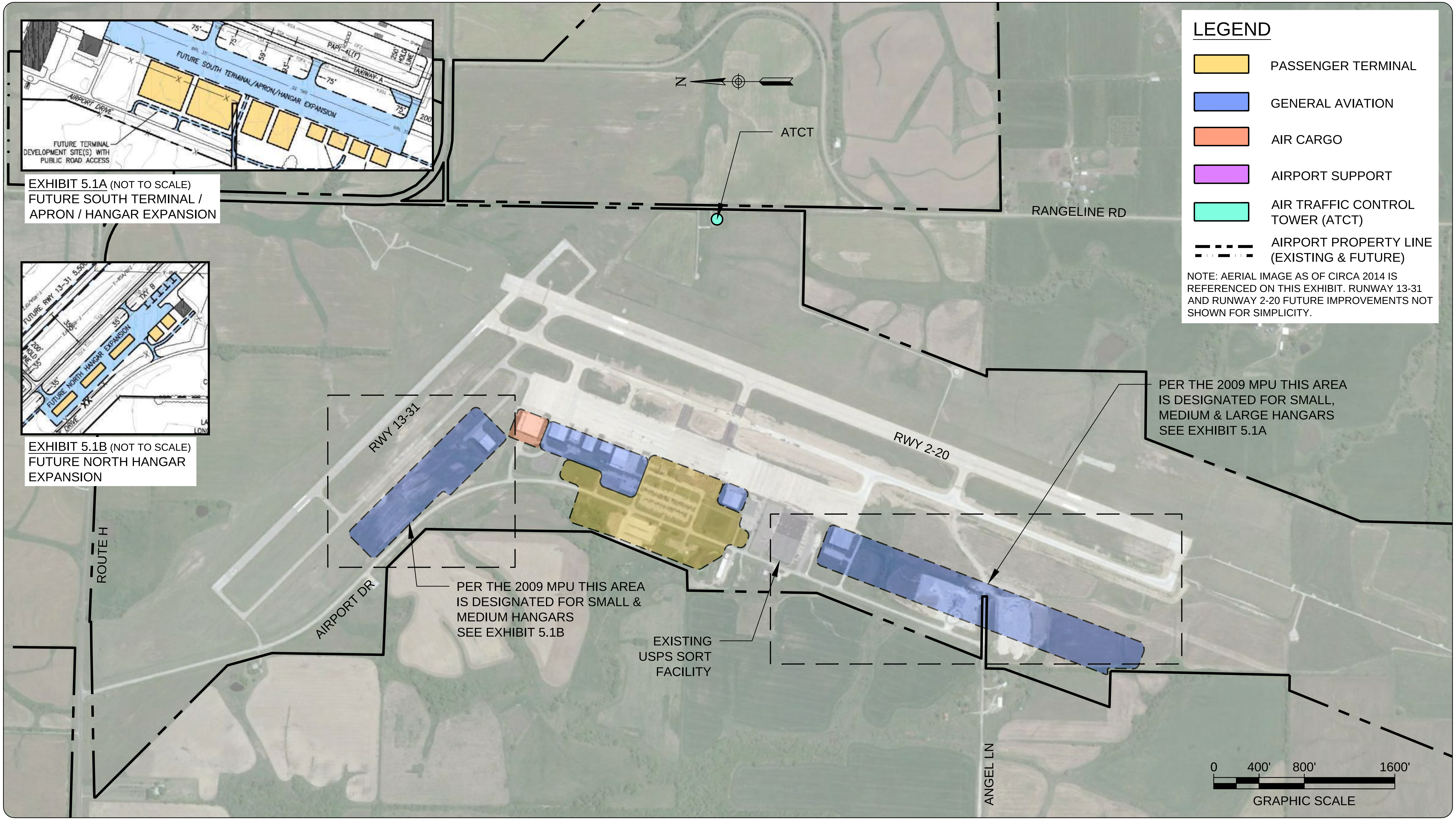
5.1.6 Alternative 6: West Airfield

Alternative 6 relocates all passenger terminal operations and functions to the north side of the airfield between Airport Drive and Taxiway B, as shown in **Exhibit 5.6**. The existing terminal area would be redeveloped into additional general aviation use and/or for charter operations.

Aircraft access to the new terminal site would occur off of Taxiway B. Vehicular access would be provided via Airport Drive.

This site is restricted by the existing Taxiway B (soon to be renamed Taxiway C) and Airport Drive.

Exhibit 5.1 Alternative 1 – Land Use Overview


LEGEND
PASSENGER TERMINAL
GENERAL AVIATION
AIR CARGO
AIRPORT SUPPORT
AIR TRAFFIC CONTROL TOWER (ATCT)
AIRPORT PROPERTY LINE (EXISTING & FUTURE)
N
ATCT
RANGELINE RD
RWY 13-31
RWY 2-20
ROUTE H
AIRPORT DR
ANGEL LN
0
400'
800'
1600'
GRAPHIC SCALE
FUTURE SOUTH TERMINAL/APRON/HANGAR EXPANSION
AIRPORT DRIVE
FUTURE TERMINAL DEVELOPMENT SITE(S) WITH PUBLIC ROAD ACCESS
PAPI-4L(F)
TAXIWAY A
FUTURE RWY 13-31
FUTURE NORTH HANGAR EXPANSION
TXY B

NOTE: AERIAL IMAGE AS OF CIRCA 2014 IS REFERENCED ON THIS EXHIBIT. RUNWAY 13-31 AND RUNWAY 2-20 FUTURE IMPROVEMENTS NOT SHOWN FOR SIMPLICITY.

EXHIBIT 5.1A (NOT TO SCALE)
FUTURE SOUTH TERMINAL / APRON / HANGAR EXPANSION

EXHIBIT 5.1B (NOT TO SCALE)
FUTURE NORTH HANGAR EXPANSION

PER THE 2009 MPU THIS AREA IS DESIGNATED FOR SMALL, MEDIUM & LARGE HANGARS SEE EXHIBIT 5.1A

PER THE 2009 MPU THIS AREA IS DESIGNATED FOR SMALL & MEDIUM HANGARS SEE EXHIBIT 5.1B

EXISTING USPS SORT FACILITY

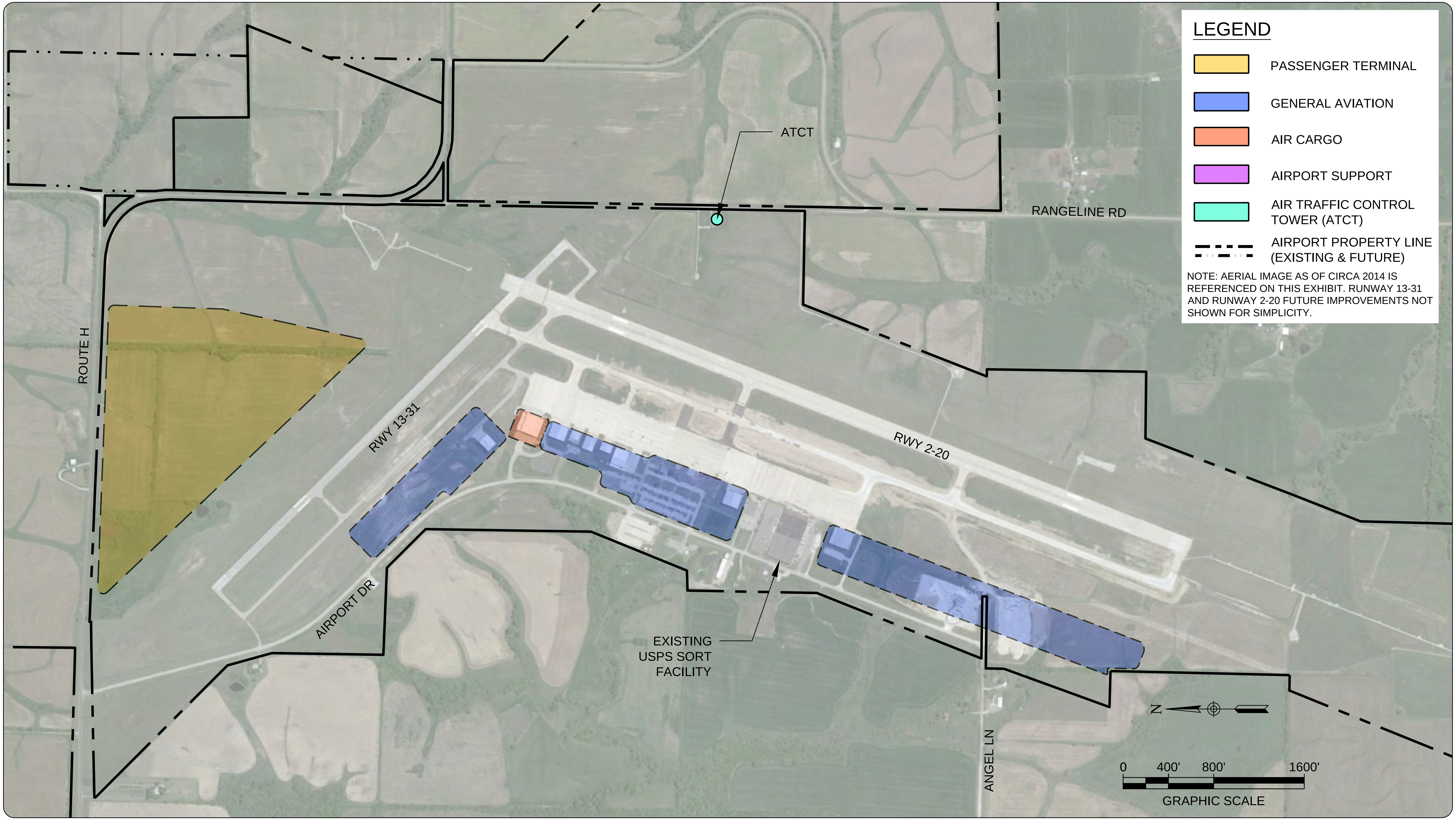
COLUMBIA Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

ALTERNATIVE 1 (EXISTING SITE) - LAND USE OVERVIEW

EXHIBIT
5.1

Exhibit 5.2 Alternative 2 – Land Use Overview


LEGEND
PASSENGER TERMINAL
GENERAL AVIATION
AIR CARGO
AIRPORT SUPPORT
AIR TRAFFIC CONTROL TOWER (ATCT)
AIRPORT PROPERTY LINE (EXISTING & FUTURE)
NOTE: AERIAL IMAGE AS OF CIRCA 2014 IS REFERENCED ON THIS EXHIBIT. RUNWAY 13-31 AND RUNWAY 2-20 FUTURE IMPROVEMENTS NOT SHOWN FOR SIMPLICITY.
ATCT
RANGELINE RD
ROUTE H
RWY 13-31
RWY 2-20
AIRPORT DR
EXISTING USPS SORT FACILITY
ANGEL LN
N
0
400'
800'
1600'
GRAPHIC SCALE

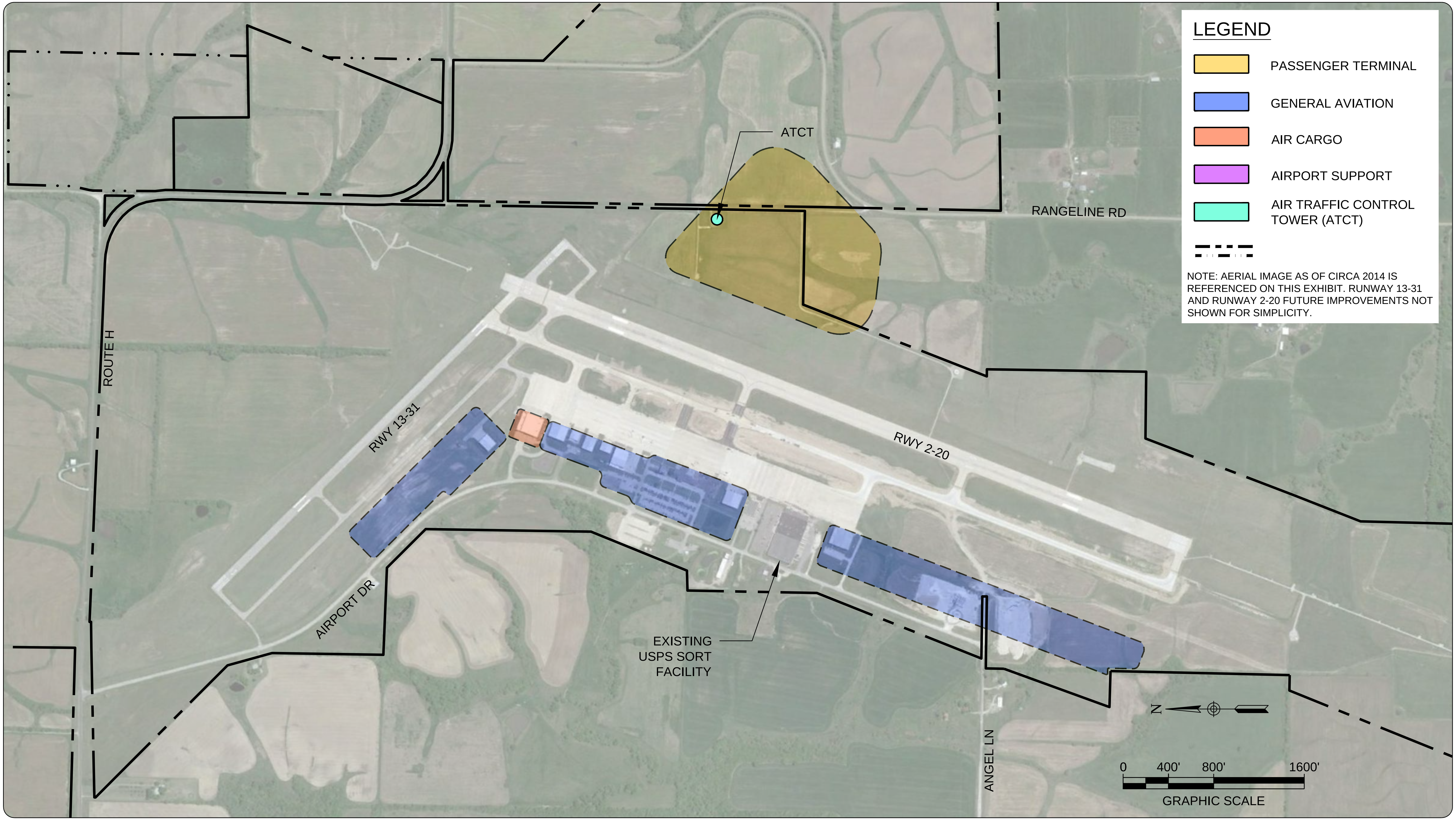
COLUMBIA
Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

ALTERNATIVE 2 (NORTHWEST AIRFIELD) - LAND USE OVERVIEW

EXHIBIT
5.2

Exhibit 5.3 Alternative 3 – Land Use Overview



NOTE: AERIAL IMAGE AS OF CIRCA 2014 IS REFERENCED ON THIS EXHIBIT. RUNWAY 13-31 AND RUNWAY 2-20 FUTURE IMPROVEMENTS NOT SHOWN FOR SIMPLICITY.

COLUMBIA
Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

ALTERNATIVE 3 (EAST AIRFIELD) - LAND USE OVERVIEW

EXHIBIT
5.3

Exhibit 5.4 Alternative 4 – Land Use Overview

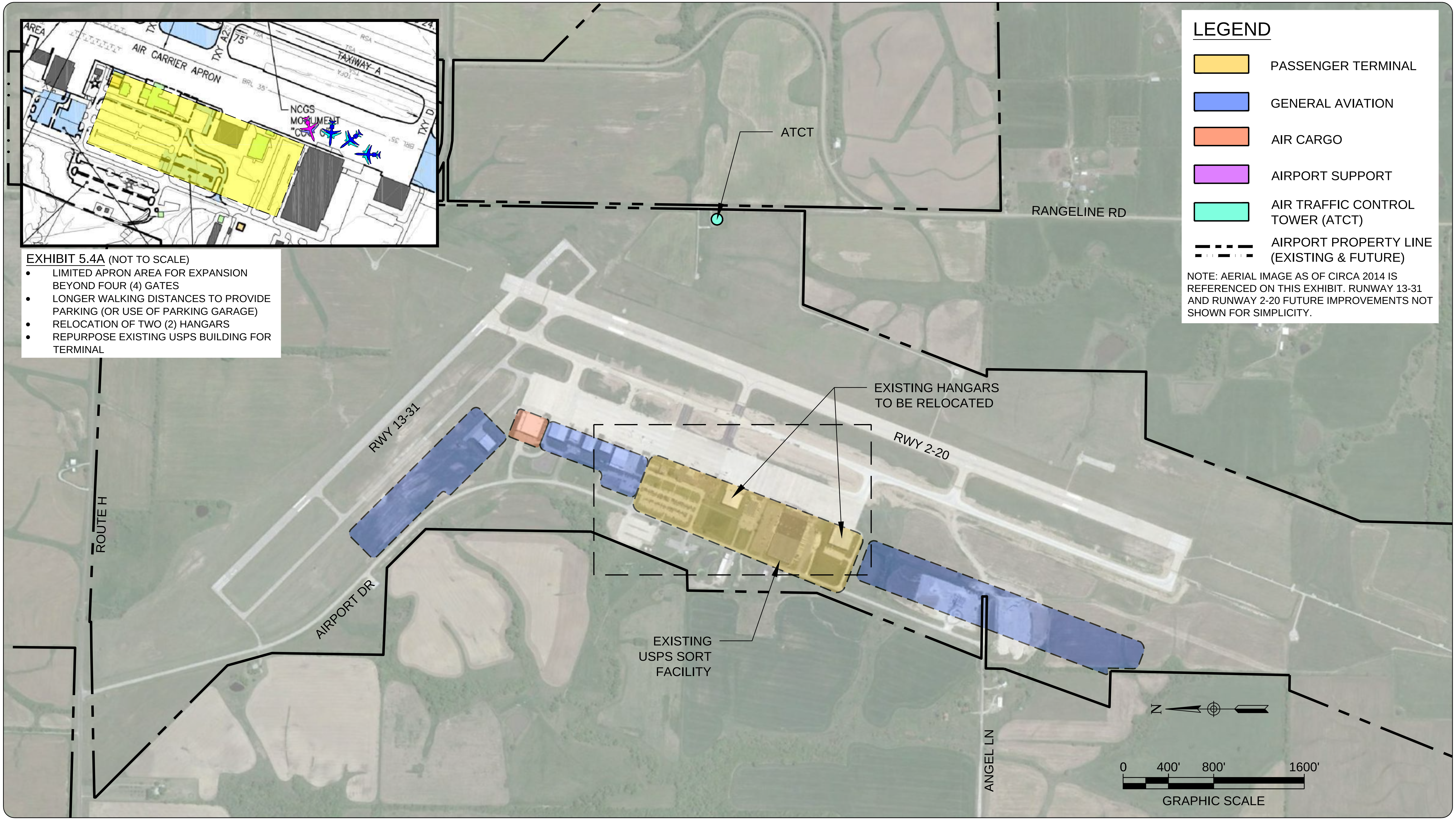


EXHIBIT 5.4A (NOT TO SCALE)

- LIMITED APRON AREA FOR EXPANSION BEYOND FOUR (4) GATES
- LONGER WALKING DISTANCES TO PROVIDE PARKING (OR USE OF PARKING GARAGE)
- RELOCATION OF TWO (2) HANGARS
- REPURPOSE EXISTING USPS BUILDING FOR TERMINAL

LEGEND

🟨	PASSENGER TERMINAL
🟦	GENERAL AVIATION
🟧	AIR CARGO
🟪	AIRPORT SUPPORT
🟩	AIR TRAFFIC CONTROL TOWER (ATCT)
— · —	AIRPORT PROPERTY LINE (EXISTING & FUTURE)

NOTE: AERIAL IMAGE AS OF CIRCA 2014 IS REFERENCED ON THIS EXHIBIT. RUNWAY 13-31 AND RUNWAY 2-20 FUTURE IMPROVEMENTS NOT SHOWN FOR SIMPLICITY.

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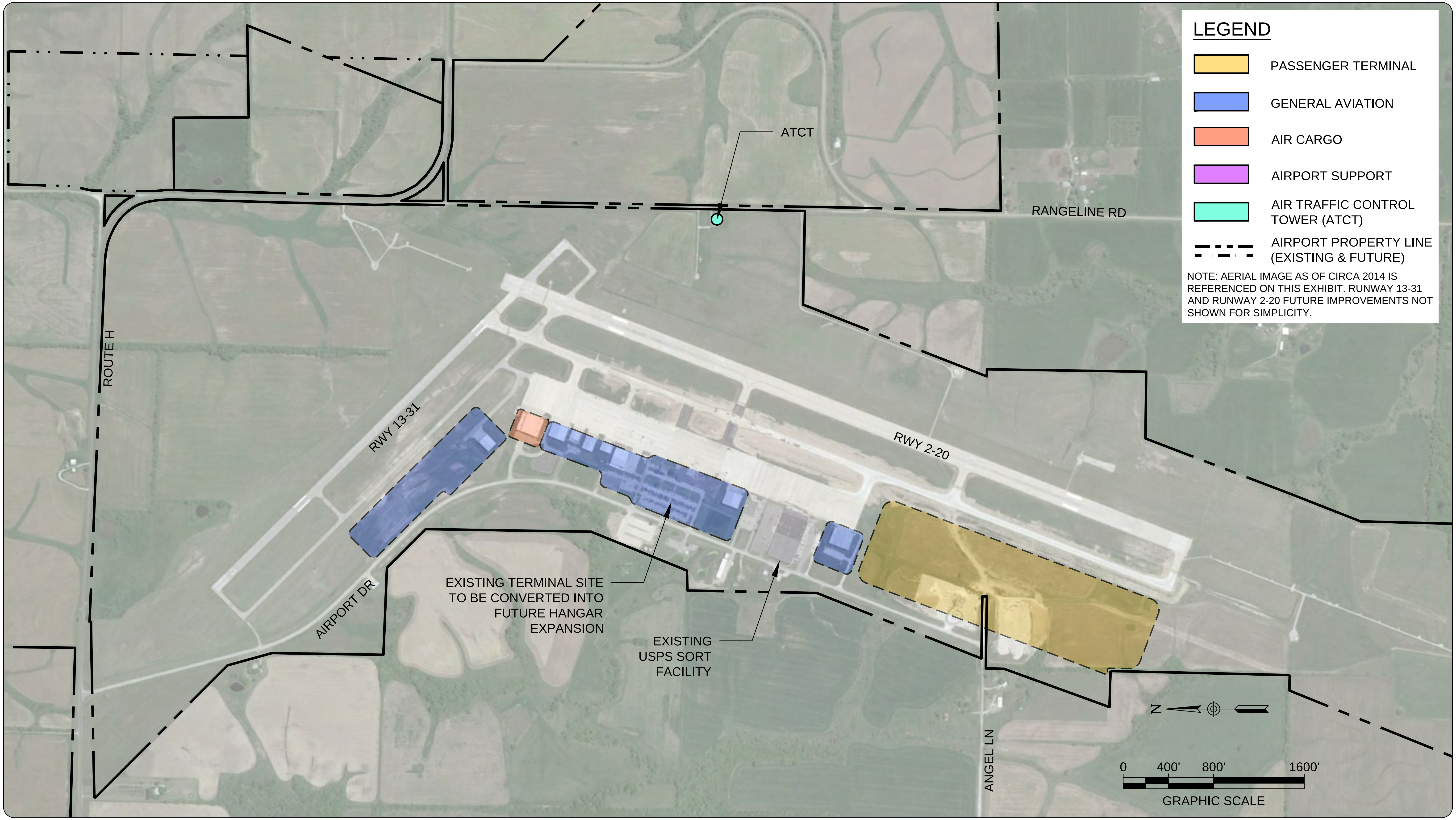
ALTERNATIVE 4 (USPS FACILITY) - LAND USE OVERVIEW

EXHIBIT
5.4

Exhibit 5.5 Alternative 5 – Land Use Overview


LEGEND
PASSENGER TERMINAL
GENERAL AVIATION
AIR CARGO
AIRPORT SUPPORT
AIR TRAFFIC CONTROL TOWER (ATCT)
AIRPORT PROPERTY LINE (EXISTING & FUTURE)
ATCT
RANGELINE RD
ROUTE H
RWY 13-31
RWY 2-20
AIRPORT DR
EXISTING TERMINAL SITE TO BE CONVERTED INTO FUTURE HANGAR EXPANSION
EXISTING USPS SORT FACILITY
ANGEL LN
N
0
400'
800'
1600'
GRAPHIC SCALE

NOTE: AERIAL IMAGE AS OF CIRCA 2014 IS REFERENCED ON THIS EXHIBIT. RUNWAY 13-31 AND RUNWAY 2-20 FUTURE IMPROVEMENTS NOT SHOWN FOR SIMPLICITY.

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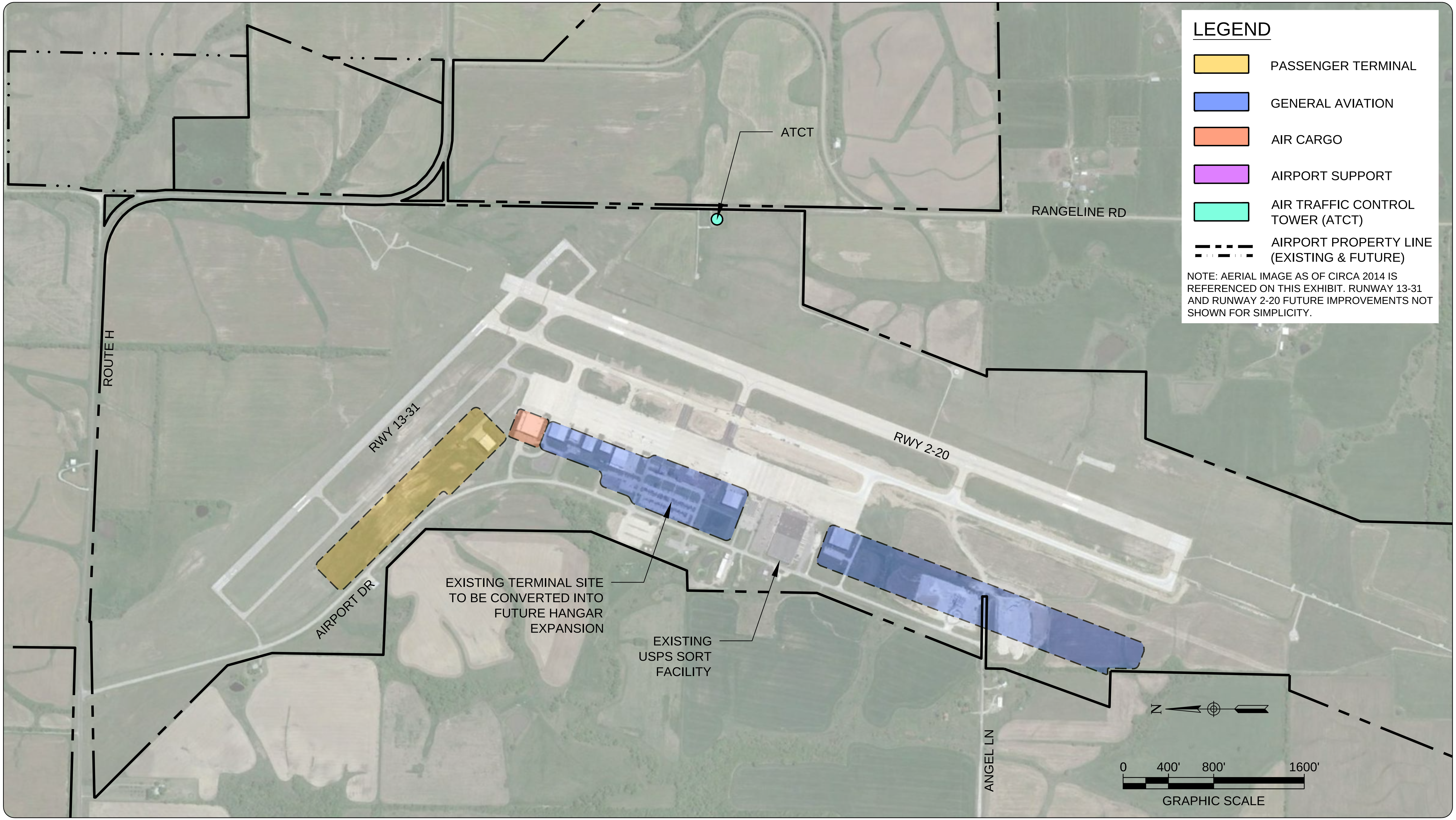
ALTERNATIVE 5 (SOUTHWEST AIRFIELD) - LAND USE OVERVIEW

EXHIBIT
5.5

Exhibit 5.6 Alternative 6 – Land Use Overview


LEGEND
🟨 PASSENGER TERMINAL
🟦 GENERAL AVIATION
🟧 AIR CARGO
🟪 AIRPORT SUPPORT
🟩 AIR TRAFFIC CONTROL TOWER (ATCT)
AIRPORT PROPERTY LINE (EXISTING & FUTURE)
ATCT
RANGELINE RD
ROUTE H
RWY 13-31
RWY 2-20
AIRPORT DR
EXISTING TERMINAL SITE TO BE CONVERTED INTO FUTURE HANGAR EXPANSION
EXISTING USPS SORT FACILITY
ANGEL LN
N
0
400'
800'
1600'
GRAPHIC SCALE

NOTE: AERIAL IMAGE AS OF CIRCA 2014 IS REFERENCED ON THIS EXHIBIT. RUNWAY 13-31 AND RUNWAY 2-20 FUTURE IMPROVEMENTS NOT SHOWN FOR SIMPLICITY.

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ALTERNATIVE 6 (WEST AIRFIELD) - LAND USE OVERVIEW

EXHIBIT
5.6

5.2 Preliminary Screening

The six land use alternatives identified in Section 5.1 were evaluated based on the pros and cons of each alternative. A preliminary screening of these six land use alternatives was conducted to shortlist the number of alternatives to a more management number for the final (secondary) evaluation.

The preliminary screening criteria included the following:

Minimal property acquisition

Minimal environmental impacts

Maximum use of existing infrastructure

Flexibility/expandability to meeting PAL 3 and beyond

Ease of Airfield/Landside access

Minimal impacts to current tenants

Operational impacts during construction

Separation of GA and Airline activities for security and safety

The preliminary screening summary is presented in **Table 5.1**. Alternatives 1, 2, and 5 were shortlisted for further analysis and screening.

Alternative 1 was shortlisted due to the existing facilities and infrastructure available at the existing site, its apparent lack of environmental impacts or need for land acquisition, as well as its existing available access to the airfield and primary runway, and to further evaluate whether a new terminal building could be constructed at this location at a reduced cost compared to a new greenfield site.

Alternative 2 was shortlisted due to its apparent ability to expand and be flexible for predicted growth, ease of access to US 63, lack of phasing issues related to keeping commercial operations online during construction, lack of property acquisition, apparent minimal environmental impacts, and its capability in eliminating the existing security concern related to GA and commercial aircraft co-location at the same apron.

Alternative 5 was shortlisted due to its apparent ability to expand and be flexible for predicted growth, use of existing facilities (namely Airport Drive), access to the primary runway, lack of phasing issues related to keeping commercial operations online during construction, apparent minimal environmental impacts, and the capability in eliminating the existing security concern related to GA and commercial aircraft co-location at the same apron.

Alternatives 3, 4, and 6 were not shortlisted primarily due to lack of development envelop without significant property acquisition, tenant impacts or environmental impacts; poor landside access; and/or lack of available existing facilities.

Table 5.1 Preliminary Screening Summary

Alt.	Description/ Location	Pros	Cons	Short-listed
1	Existing Site	• Existing infrastructure available at location including RON parking. • Existing ground access available via Airport Drive. • Central airfield location along primary runway for airfield operational efficiency and safety. • No property acquisition necessary.	• Site between two GA areas – Security / SIDA concerns remain • Limited expansion envelope on airfield to meet the need without impact to existing hangars / tenants (and related costs to relocate). • Vehicular parking across Airport Drive increases potential pedestrian conflicts and increases walking distances to terminal (possible need for parking facility). • Operational / phasing challenges during construction. • Potential environmental impact at existing wooded drainage feature for PAL 5 expansion.	Yes
2	Northwest Airfield	• No property acquisition necessary. • Permanent separation of GA/Commercial aircraft. • Expandability / flexibility beyond PAL 3. • Direct vehicular access from Route H/US 63. • No existing tenant impacts. • No operational / phasing issues. • Potential reuse of existing terminal building/area for GA.	• No existing taxiway / apron infrastructure. • No existing utility connections. • No landside access exists. • Increased ARFF response time to south airfield if co-located with terminal building. • Not a central airfield location for airfield operational efficiency and safety.	Yes
3	East Airfield	• Permanent separation of GA/Commercial aircraft. • Central airfield location along primary runway for airfield operational efficiency and safety.	• Requires property acquisition. • Potential environmental impacts at drainage feature.	No

Alt.	Description/ Location	Pros	Cons	Short-listed
		• No operational / phasing issues. • Potential reuse of existing terminal building/area for GA.	• Increased vehicular access distance from US 63. • No existing taxiway / apron infrastructure on the east side of the primary runway. • No existing utility connections • Potential ATCT line of sight issues. May require ATCT relocation.	
4	USPS Facility	• Potential reuse of USPS facility as passenger terminal (Approx. 100,000 square feet). • Existing infrastructure available at location. • Larger potential development envelope. • Central airfield location along primary runway for airfield operational efficiency and safety.	• Impacts to multiple existing tenants. • Requires realignment of Airport Drive to allow for curbside frontage need. • Limited airside flexibility / expansion potential (not enough apron width for more than 4 aircraft positions). • Significant cost to relocate facility. • Does not separate GA from commercial with future GA at south apron	No
5	Southwest Airfield	• Permanent separation of GA/Commercial aircraft. • Access to primary runway and use of Taxiway Alpha for airfield operational efficiency and safety. • Potential reuse of existing terminal building/area for GA • Larger potential development envelope. • Increased flexibility beyond PAL 3. • No existing tenant impacts. • No operational / phasing issues.	• No existing apron infrastructure. • Increased vehicular access distance from route to US 63 • Cul-de-sac at Angel Lane to eliminate traffic on minor rural road. • Future GA facilities from Airport Master Plan would require relocation to a different site. • Increased ARFF response time to north airfield if co-located with terminal building. • Site restricted by property line will require longer walking distances	Yes

Alt.	Description/ Location	Pros	Cons	Short-listed
		• Minor right-of-way vacation/dedication to City (property acquisition)	(possible need for parking facility).	
6	West Airfield	• Permanent separation of GA/Commercial aircraft. • Minor existing tenant impacts. • No operational / phasing issues. • Existing taxiway and vehicular access infrastructure. • Potential reuse of existing terminal building/area for GA	• Future GA facilities from Airport Master Plan would require relocation. • Limited / constrained development envelope without significant property acquisition and relocation of Airport Drive • Not a central airfield location. • Increased ARFF response time to south airfield if co-located with terminal building. • No existing apron infrastructure.	No

5.3 Secondary Screening of Alternatives

5.3.1 Identification of Evaluation Criteria

Five additional evaluation criteria were developed to further analyze each of the shortlisted alternatives. Quantitative measures were used to evaluate the alternatives as much as possible; however, some qualitative measures were substituted where qualitative measures could not accurately compare alternatives. The five additional secondary evaluation criteria include:

- Meets 20-year (PAL 3) Terminal Program Requirements
- Long Term Needs and Future Flexibility
- Operational Efficiency and Compatibility (airfield safety and efficiency as well as landside vehicle / pedestrian safety and efficiency)
- Cost Effectiveness and Ease of Implementation
- Environmental Compatibility

5.3.1.1 *Meets Terminal Program Requirements*

This criterion refers to the ability of each alternative to meet the PAL 3 facility requirements identified in Chapter 4 based upon the FAA approved 20-year forecast.

5.3.1.2 *Long Term Needs and Future Flexibility*

Long Term Needs and Future Flexibility refers to the ability of each alternative to satisfy the needs of the Airport beyond the 20-year (PAL 3) anticipated demand to the PAL 5 activity levels and beyond. This criterion also considers the ability for each alternative to provide flexibility resulting from unforeseen change(s) at the Airport.

5.3.1.3 *Operational Efficiency and Compatibility*

Operational efficiency refers to each alternative's ability to maximize passenger and baggage throughput at the terminal facility, its ability to minimize disruptions to aircraft movements on the airfield, its ability to minimize disruptions to pedestrian / vehicle movements landside, and considers the relationship between future development and the design aircraft's operating requirements. The compatibility portion of this criterion refers to the alternative's potential effects on existing tenants at the Airport as a result of the project's location.

In more detail, the following sub-criteria is considered for each alternative:

- Passenger and Baggage Through-put
- Airfield Safety & Efficiency with respect to
    - Runway crossings (aircraft to aircraft conflicts)
    - Runway crossings (aircraft to fuel truck conflicts)
    - Taxi distances
    - ATCT line of sight
    - ARFF responsiveness
    - Separation of GA/commercial – security
- Landside Safety and Efficiency with respect to
    - Pedestrian – walking distances
    - Pedestrian to vehicle conflicts

5.3.1.4 *Cost Effectiveness and Ease of Implementation*

The cost effectiveness criterion compares the anticipated development costs of each alternative. Major development projects and order of magnitude costs were evaluated for each alternative for the Opening Day costs as well as a 10-year horizon from that Opening Day cost. This resulted in evaluation of costs for Opening Day (estimated based upon 2017 enplanement activities to be near the PAL 2 stage), PAL 3 program costs (which also correlate closely with the Opening Day + 10 Year horizon).

The intent of this criterion is to evaluate the financial feasibility and cost-effectiveness associated with each alternative.

Ease of implementation refers to the phasing and implementation difficulty of each alternative. The ability of the alternative to maintain existing terminal operations during construction, and the potential effects on existing tenants at the Airport during construction are key elements to this criterion.

5.3.1.5 *Environmental Compatibility*

The Environmental Compatibility criterion refers to each alternative's potential impact to the surrounding environment, as well as the impact of the alternative on nearby residential areas.

5.4 Shortlist Alternatives

The three shortlisted alternatives were further refined from the land use stage presented in Section 5.1. A site layout, preliminary floor plan, and order of magnitude cost estimate was developed for each build alternative for the purposes of the secondary screening outlined in Section 5.4. Details related to the three shortlist build alternatives and the no-build alternative are outlined in the following subsections.

5.4.1 Alternative 1: Existing Site

Exhibit 5.7A and **Exhibit 5.7B** shows the site overview for Alternative 1.

In order to provide the necessary passenger terminal area to meet the PAL 3 program, the vehicle curb front road is shifted approximately 60 feet to the west, closer to Airport Drive. This will allow for the expansion of the terminal towards the west without impacting the amount of apron space needed to park the anticipated design aircraft. In a radial style parking arrangement, 3 aircraft parking positions can be achieved at this site for PAL 3 and a 4th parking position can be added for PAL 5. All parking positions at the terminal in this radial arrangement can be served by passenger boarding bridges. See **Exhibit 5.7A**.

Additional gates beyond PAL 5 (more than 4 gates) would require relocation of the adjacent hangar to the south of the proposed terminal. Further, to provide more than 4 gates, aircraft will have to be parked in a straight-in arrangement and a simple holdroom expansion on the terminal will be needed to allow for a passenger boarding bridge at each parked position. As illustrated in **Exhibit 5.7B**, this is will also require the curb front road to be shifted further to the west (by an additional 11-feet) to allow for the additional aircraft parking depth for this straight-in parking arrangement which will lead to less room for passenger vehicle parking and increase the need for parking more remote from the terminal or a parking garage. For this reason it was determined that while this Alternative meets the PAL 5 requirements, it has difficulty in having the necessary flexibility and expandability for growth beyond PAL 5.

2 RON parking positions for this Alternative will be located in front of the FAA Flight Service Station (FSS) or in front of the USPS building (neither uses the apron for aeronautical needs).

Additional parking areas are required between the relocated curb front road, the FAA Flight Service Station, as well as a larger area to the west across Airport Drive. As parking increases in size towards the west airport property boundary, a US Army Corps of Engineers permit and grading easement may be required for construction in the existing wooded, natural drainage swale in this area. Given the patch-work nature of the parking areas of this alternative, revenue and access control will be more costly to implement in that one large parking area cannot be controlled but instead several smaller ones requiring more equipment.

Sufficient land is available for parking expansion up to PAL 5, however passenger walking distance from the front door of the terminal building to the furthest parking space would be located approximately 1175 feet away. See **Exhibit 5.14** for walking distance comparisons between terminal sites.

Existing landside access would remain along Airport Drive. It is planned, under this Alternative, that Airport Drive will be expanded to a 3-lane road to allow for a dedicated left turn lane which will provide added safety.

The preliminary floor plan for all three build alternatives is shown in **Exhibit 5.8**. This preliminary terminal floor plan can be located on this site and addresses the program needs for passenger through-put, baggage handling, and airline operational needs. The preliminary floor plan assumes a split-level facility, with all passenger processing areas on the ground level. Lower level facilities include airport administration, support, and storage space. Expansion beyond PAL 3 to the PAL 5 demand level is achievable in all processing areas, including the SSCP, which would consist of an initial build of 2 screening lanes, with an ultimate expansion allowable to three screening lanes.

While coordinating with stakeholders during the TAMP, it was suggested by the airline partners that further consideration should be given (in the design stage) to rotating the SSCP area 90 degrees to allow for a two-sided (non-secure/secure) concessions space. This should be investigated more at the next stage of the program.

Airfield efficiency and safety measures at this site are the same as is afforded by the existing site, of course. In this criterion, runway crossings for aircraft to go to and from the terminal location to the runway ends are unchanged. Similarly, the FBO which is the fueler for the airport is located adjacent to the site; and, thus the efficiency and safety with regard to aircraft to fueling truck interactions is the same. However, because this alternative shares the same site with the existing terminal area, it also has the same problem in that the terminal operations are sandwiched between adjacent GA operations. This co-location of airline and GA operations presents certain security related risks (unauthorized access into the SIDA area) as well as increased potential for GA aircraft interactions/conflicts with airline aircraft.

The ARFF building would be adjacent, but separated from the main passenger terminal to the north, at the location of the existing North Terminal Building. ARFF response time to the mid-point on the primary runway is well within the time allowance. See **Appendix C** for details.

This site was also checked for the ATCT's Line-of-sight to provide a baseline comparison against the other alternatives. See **Exhibit 5.15** and **5.15A**. The minimums for line-of-sight are met from the tower to this alternative location.

Landside efficiency and safety were also reviewed for this alternative location. In particular, this site requires parking expansion in areas along Airport Drive as well as across Airport Drive. In some of the parking areas, the terminal airline passenger parking will directly compete with adjacent tenant parking. One way to mitigate this will be to fence off and access control areas for dedicated tenant parking. In order to provide parking expansion across Airport Drive, there is an increase to pedestrian to vehicle conflicts. During the Safety Risk Assessment as well as Airline Coordination meetings, the amount of pedestrian interaction with vehicular traffic on

Airport Drive was seen to be a significant negative for this site. Mitigation to this may include use of a parking garage to capture parking within the Airport Drive perimeter, manage pedestrian movements to eliminate vehicle interactions at high-speeds, or the relocation of Airport Drive itself to entirely envelop parking within the drive.

Constructability and the phasing of this alternative around active operations was considered. Essentially, to construct around the active terminal building, the first phase will include building the necessary parking areas and constructing the curbside lanes to pull back customer parking and the terminal frontage to allow for the building construction itself. This will provide a safe work zone to separate the general public and construction activity. Concurrent with this first phase is the construction of the ARFF and operation center so that airport staff can continuously operate while the main terminal building is under construction. The next major phase will be to temporarily relocate the current baggage facilities to the north side of the existing building (and possibly housing some of its facilities in the old ARFF bays, as space demands). This will allow for the demolition of the south portion of the existing building and construction of the ticketing half of the new building. Once this phase is complete, leaving the temporary baggage facilities in place, the demolition of the north half of the old building can begin, followed by the construction of the baggage half of the new building.

Airspace for each alternative site was reviewed for TERPS and Part 77 criteria. See **Appendix I** for OEAAA submitted material and FAA determination/objections. No negative impacts are anticipated for this site. See **Exhibit 5.18**.

The overall costs of this alternative are presented in more detail in **Appendix F**.

5.4.2 Alternative 2: Northwest Airfield

The initial site overview for Alternative 2 is shown in **Exhibit 5.9** (labeled as “Initial Site Overview”). After a preliminary investigation to determine if any wetland impacts might be present at the site, as described in detail in Chapter 6, a second site layout (labeled as “Original Site 2 Preferred”) was developed to avoid identified wetlands. See **Exhibit 5.11**. Upon further discussions with airline partners the final layout for this site was developed (labeled as “Final Preferred Alternative: Site 2D Parallel Aircraft Layout”), as shown in **Exhibit 5.12E**, to rotate the building so that the apron was adjacent to the parallel taxiway (to be future Taxiway Echo) allowing for the maximum mobility, ground service equipment working room, and access to the airfield from the apron (allowing more than one access point to the airfield strongly desired by the airlines).

In a radial style parking arrangement, as shown in **Exhibit 5.9, 5.11** and **5.12B**, 3 aircraft parking positions can be achieved under this alternative for PAL 3 and a 4th parking position can be added for PAL 5. All parking positions at the terminal in this radial arrangement can be served by passenger boarding bridges. This site also has the proper development envelop to allow for straight-in parking on the apron (**Exhibit 5.12A**) with the aircraft being serviced, again, by passenger boarding bridges for all 4 gates as well. **Exhibits 5.12C** and **5.12D** illustrate power-in and push-back movements for future aircraft at the site.

Additional gates beyond PAL 5 (more than 4 gates) can easily be accommodated at this site by parking aircraft in a straight-in arrangement and with a simple holdroom expansion on the terminal to allow for a passenger boarding bridge at each parked position.

The ARFF access drive is located east of the main air carrier operations apron. This allows for future expansion of the apron, closer proximity of the ARFF to the midpoint of the airfield, and allows for emergency vehicle access without impact to aircraft operations on the apron.

Sufficient land is available for parking expansion up to PAL 5 with passenger walking distance from the front door of the terminal building to the furthest parking space would be located approximately 840 feet in distance away. See **Exhibit 5.14** for walking distance comparisons between terminal sites.

Landside access would come from Route H directly, locating the entry plaza at the high point along Route H for proper roadway sight-distances. The loop road into this alternative's terminal area will easily allow for access control for future parking revenue collection.

The preliminary floor plan for all three build alternatives is shown in **Exhibit 5.8** and meets the program needs for PAL 3 and PAL 5.

Airfield efficiency and safety measures at this site were discussed and considered in detail. See the Safety Risk Management Documentation (SRMD) found in **Appendix H** for details on the hazards, risks and mitigations determined as necessary to achieve an acceptable level of safety and efficiency for this alternative. The primary hazards identified for this Alternative and their mitigations (as discussed during the Risk Assessment) are summarized below:

Hazard #	Hazard Description	Mitigation / Remark
COU-01	ATC Line-of-Sight	study confirmed Alternative within acceptable line-of-sight standards to ATC
COU-02	ATC Hours of Operation	Airport and FAA working to extend hours
COU-03	Fuel Trucks crossing Rwy 13-31	End around perimeter road added to Alt. to eliminate crossing
COU-04	Commercial AC crossing Rwy 13-31	Connection to Twy B for taxi around Rwy 13-31 high energy zone

For the airfield efficiency / safety criterion, runway crossings of Runway 13-31 were given serious consideration. The FBO, which is the fueler for the airport, is located adjacent to the existing terminal. The FBO will provide a dedicated fueling truck for airline operations at the terminal but will need to cross the airfield once per day to bulk fill the tanker. This will result in a crossing of Runway 13-31. Mitigation of this crossing risk was to provide an access road around the end of Runway 13 to the new terminal site.

This site eliminates the security and safety risks of co-located airline and GA operations but increases the potential for aircraft to aircraft conflict at the runway intersection in that more operations will occur from this site crossing Runway 13-31 to access Runway 2 for take-off or when returning to the terminal from landing on Runway 20. Mitigations for this risk included extension of the ATCT hours to provide manned coverage at the tower during the hours commercial airline traffic operates. In addition, mitigations also include providing access to the airfield via Taxiway B (soon to be Taxiway C) from the site to the primary runway so that commercial aircraft can go-around the crosswind runway entirely. In the future, approximated at PAL 5 when larger C-III aircraft become prevalent on the airport, the taxiway (which is now being constructed to a C-II width of 35-feet) will be widened to a 50-ft wide Group III standard.

Both taxiways (new Taxiway Echo adjacent to the site, which will be connected to the extension of Taxiway A associated with the Runway 2-20 extension project, and Taxiway B under construction on the opposite side of the crosswind runway) will be offset from Runway 13-31 by 400 feet, providing enough separation to allow for an ARC of C-III on the taxiways in the future.

The ARFF building would be adjacent, but separated from the main passenger terminal to the east, for this alternative. A preliminary response time calculation indicates that ARFF response vehicles at the Alternative 2D site can reach the midpoint of the furthest runway (Runway 2-20) within 3 minutes from time of alarm. See **Appendix C** for details.

This site was also checked for the ATCT's Line-of-sight to compare against the existing site's baseline. See **Exhibit 5.15** and **5.15B**. The minimums for line-of-sight are met from the tower to this alternative location.

Landside efficiency and safety were also reviewed for this alternative location. The passenger terminal, access roadways, and vehicular parking facilities are all located outside the ultimate RPZs of both runways. Providing for an expandable yet single large parking area at this location provides for an easy means of revenue and access control as well as easily identified pedestrian zones within the parking complex.

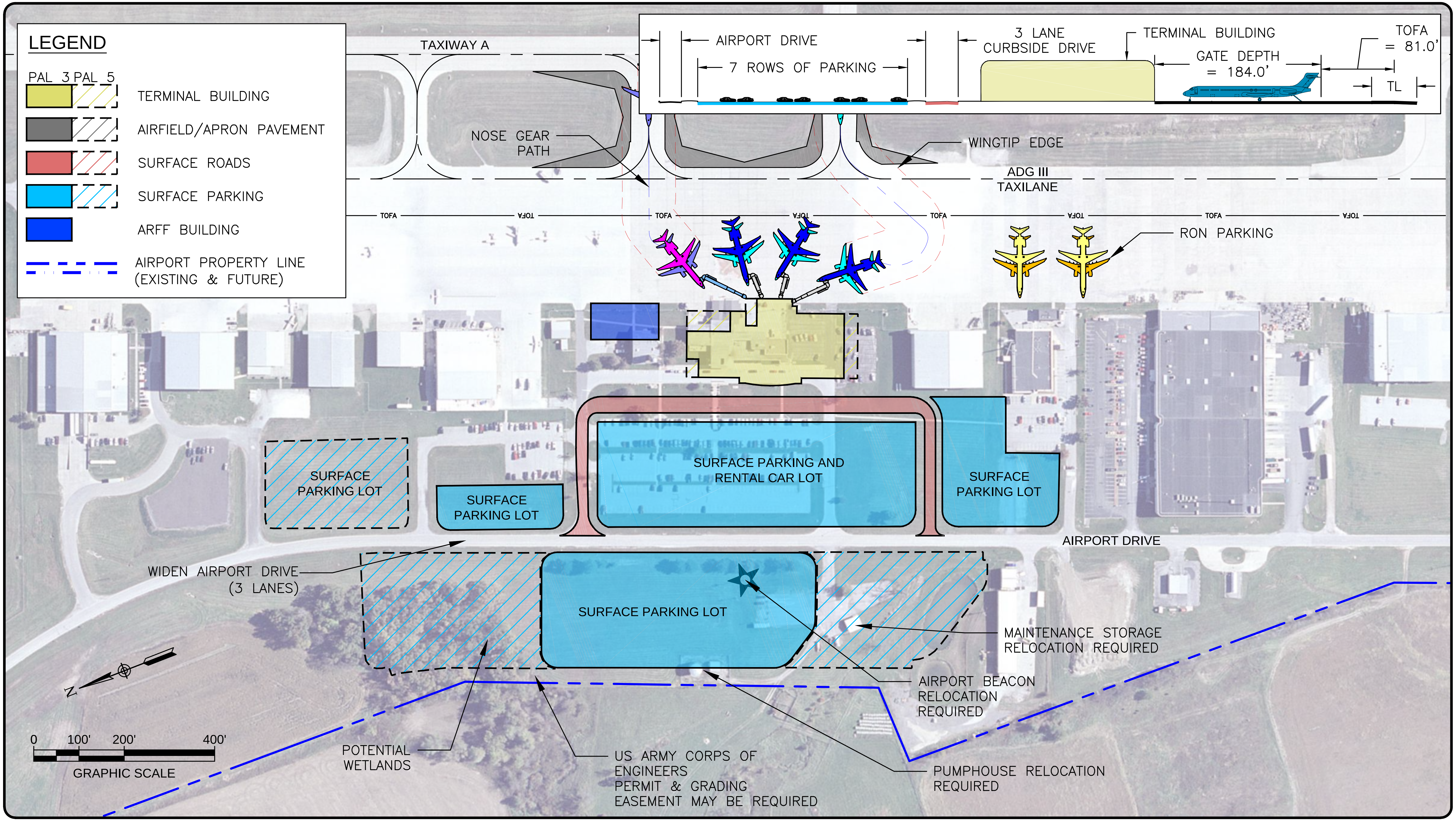
The rental car ready/return lot would be located adjacent to the baggage claim/rental car areas within the passenger terminal for quick and easy access. The terminal curb front shown allows for separation of commercial vehicles (taxis, hotel shuttles, etc.) and private vehicles onto separate curb front areas.

Airspace for each alternative site was reviewed for TERPS and Part 77 airspace criteria. See **Appendix I** for OEAAA submitted material and FAA determination/objections. No negative impacts are anticipated for this site. See **Exhibit 5.18**. See **Exhibit 5.13** for a cross section through the terminal at the site to illustrate Part 77 surface clearance of the proposed building and tail height of parked aircraft at the proposed gates.

Constructability and the phasing of this alternative is away from all active operations.

The overall costs of this alternative are presented in more detail in **Appendix F**.

Exhibit 5.7A Alternative 1: Site Overview Radial Aircraft Layout



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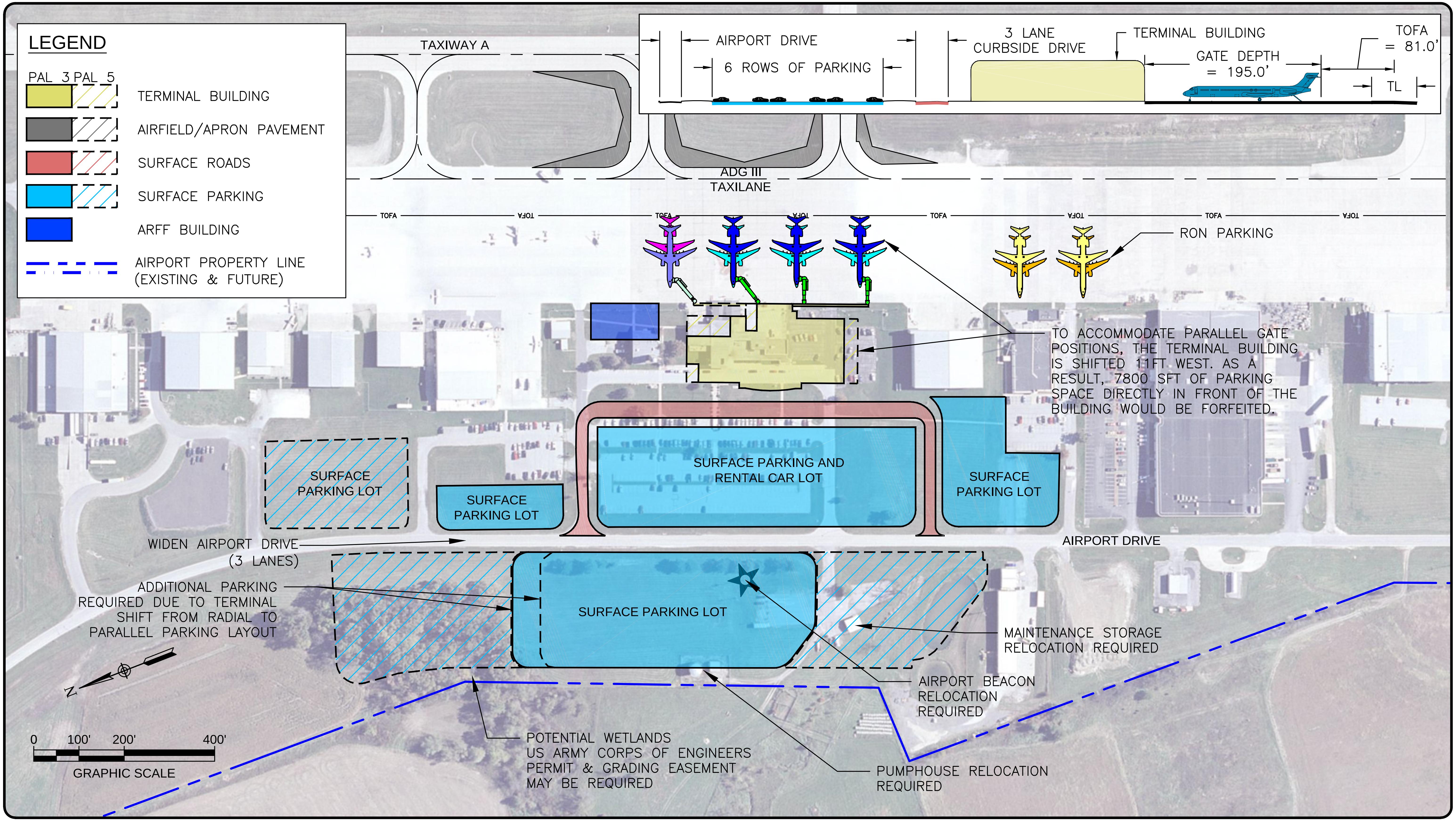
ALTERNATIVE 1: SITE OVERVIEW
RADIAL AIRCRAFT LAYOUT

EXHIBIT
5.7A

Exhibit 5.7B Alternative 1: Site Overview Straight Aircraft Layout


LEGEND
PAL 3 PAL 5
TERMINAL BUILDING
AIRFIELD/APRON PAVEMENT
SURFACE ROADS
SURFACE PARKING
ARFF BUILDING
AIRPORT PROPERTY LINE (EXISTING & FUTURE)
TAXIWAY A
AIRPORT DRIVE
6 ROWS OF PARKING
3 LANE CURBSIDE DRIVE
TERMINAL BUILDING
GATE DEPTH = 195.0'
TOFA = 81.0'
TL
ADG III TAXILANE
TOFA
RON PARKING
TO ACCOMMODATE PARALLEL GATE POSITIONS, THE TERMINAL BUILDING IS SHIFTED 11FT WEST. AS A RESULT, 7800 SFT OF PARKING SPACE DIRECTLY IN FRONT OF THE BUILDING WOULD BE FORFEITED.
SURFACE PARKING LOT
SURFACE PARKING LOT
SURFACE PARKING AND RENTAL CAR LOT
SURFACE PARKING LOT
AIRPORT DRIVE
WIDEN AIRPORT DRIVE (3 LANES)
ADDITIONAL PARKING REQUIRED DUE TO TERMINAL SHIFT FROM RADIAL TO PARALLEL PARKING LAYOUT
SURFACE PARKING LOT
MAINTENANCE STORAGE RELOCATION REQUIRED
AIRPORT BEACON RELOCATION REQUIRED
POTENTIAL WETLANDS US ARMY CORPS OF ENGINEERS PERMIT & GRADING EASEMENT MAY BE REQUIRED
PUMPHOUSE RELOCATION REQUIRED
N
0 100' 200' 400'
GRAPHIC SCALE

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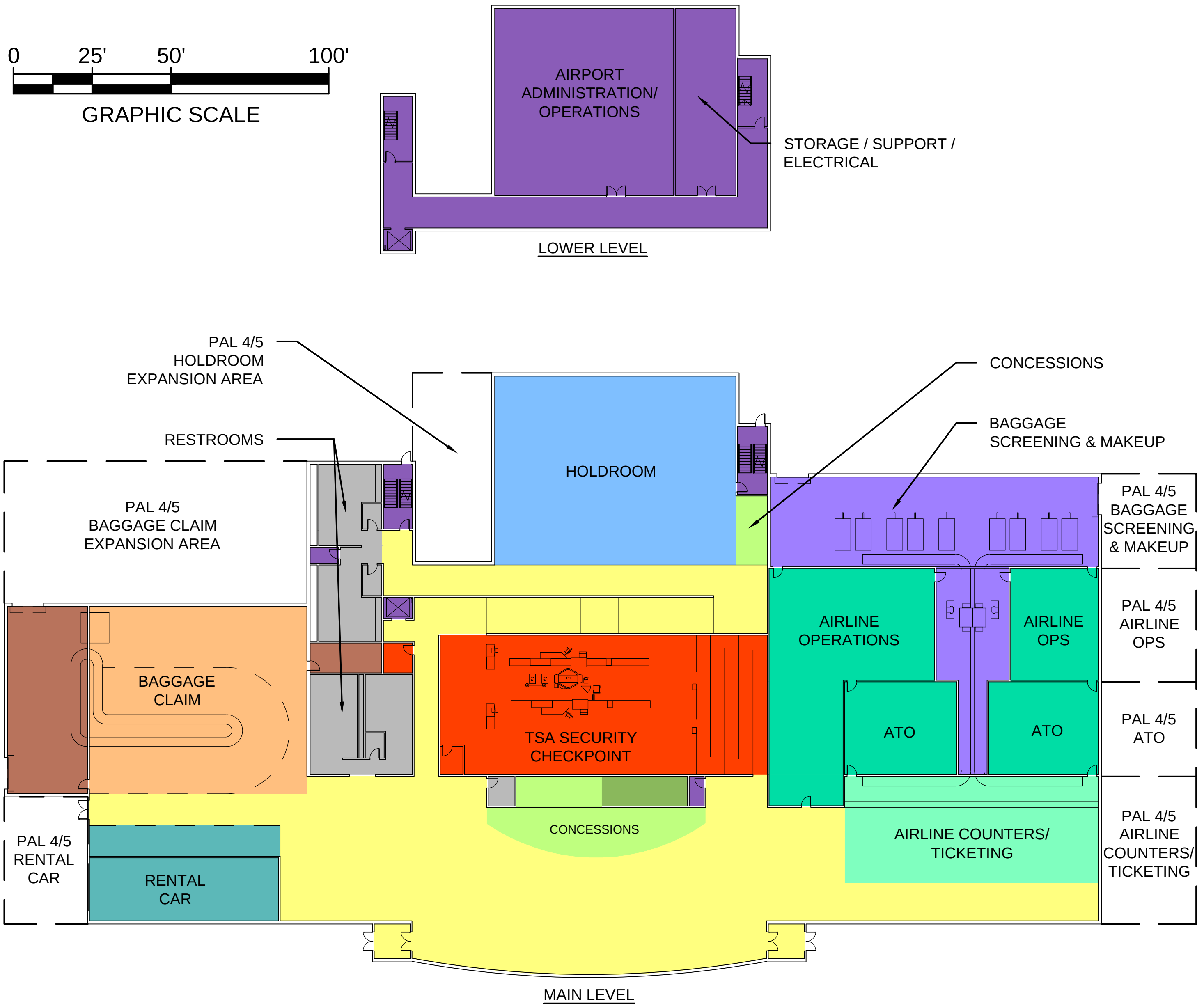
ALTERNATIVE 1: SITE OVERVIEW
PARALLEL AIRCRAFT LAYOUT

EXHIBIT
5.7B

Exhibit 5.8 Passenger Terminal Floor Plan (Alternatives 1, 2, and 5)


0
25'
50'
100'
GRAPHIC SCALE
AIRPORT ADMINISTRATION/ OPERATIONS
STORAGE / SUPPORT / ELECTRICAL
LOWER LEVEL
PAL 4/5 HOLDROOM EXPANSION AREA
RESTROOMS
CONCESSIONS
BAGGAGE SCREENING & MAKEUP
HOLDROOM
PAL 4/5 BAGGAGE CLAIM EXPANSION AREA
PAL 4/5 BAGGAGE SCREENING & MAKEUP
AIRLINE OPERATIONS
AIRLINE OPS
PAL 4/5 AIRLINE OPS
BAGGAGE CLAIM
TSA SECURITY CHECKPOINT
ATO
ATO
PAL 4/5 ATO
CONCESSIONS
PAL 4/5 RENTAL CAR
RENTAL CAR
AIRLINE COUNTERS/ TICKETING
PAL 4/5 AIRLINE COUNTERS/ TICKETING
MAIN LEVEL

LEGEND

- 🟨 Public Circulation
- 🟩 Ticketing
- 🟥 Security Screening Checkpoint
- 🟦 Holdrooms
- 🟧 Baggage Claim
- 🟩 Concessions
- 🟩 Concessions Support
- ⬜ Restrooms
- 🟦 Rental Car
- 🟩 Airline Support
- 🟪 Outbound Baggage Makeup
- 🟫 Inbound Baggage Delivery
- 🟪 Airport Support

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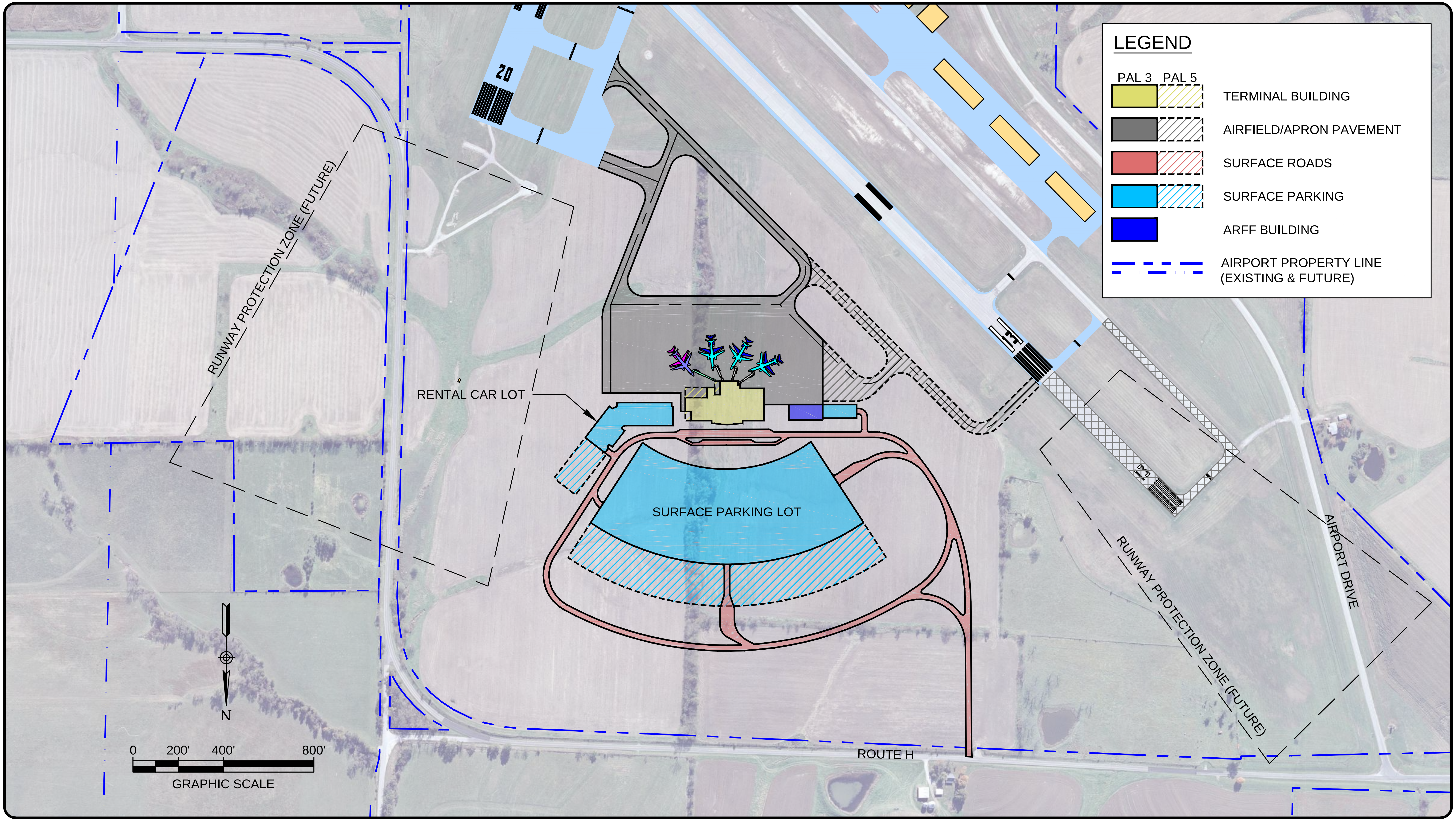
Passenger Terminal Floor Plan (Alternatives 1, 2, and 5)

EXHIBIT
5.8

Exhibit 5.9 *Alternative 2: Initial Site Overview (Original Layout 2A)*



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ALTERNATIVE 2: INITIAL SITE OVERVIEW

EXHIBIT
5.9

5.4.3 Alternative 5: Southwest Airfield

Exhibit 5.10 shows the site overview for Alternative 5.

In a radial style parking arrangement, 3 aircraft parking positions can be achieved under this alternative for PAL 3 and a 4th parking position can be added for PAL 5. See **Exhibit 5.10B**. All parking positions at the terminal in this radial arrangement can be served by passenger boarding bridges. This site also has the proper development envelop to allow for straight-in parking on the apron (**Exhibit 5.10A**) with the aircraft being serviced, again, by passenger boarding bridges for all 4 gates as well.

Additional gates beyond PAL 5 (more than 4 gates) can easily be accommodated at this site by parking aircraft in a straight-in arrangement and with a simple holdroom expansion on the terminal to allow for a passenger boarding bridge at each parked position.

2 RON parking positions for this Alternative will be located south of the ARFF so that their positions will not infringe on the exit lanes of the ARFF.

Sufficient land is available for parking expansion up to PAL 5 with passenger walking distance from the front door of the terminal building to the furthest parking space would be located approximately 1,215 feet in distance away. See **Exhibit 5.14** for walking distance comparisons between terminal sites.

At the south airport property boundary at this site, a US Army Corps of Engineers permit and grading easement may be required for construction in the existing wooded, natural drainage swale for PAL 3 parking.

A minor amount of right-of-way vacation/dedication to the City may be necessary at this site.

Existing landside access would remain along Airport Drive but Airport Drive would require widening to a three-lane section (to allow for a left-turn lane for safety) near the parking entrance point.

Two public parking areas to the west of the passenger terminal would serve the demand through PAL 3. This configuration will allow for the potential of adding pay parking capabilities in the future, if so desired. Expansion to PAL 5 levels would require either land acquisition for additional surface parking space (which in turn would require at the north area a large culvert extension for an existing drainage feature, and potentially US Army Corps of Engineers permit and grading easements at the south), remote lots with a shuttle operation, or the construction of a multi-story parking garage (as shown in **Exhibit 5.10A/B**).

The direct connection to Angel Lane would be separated from Airport Drive with Angel Lane being built into a dead end cul-de-sac to protect the rural minor roadway from increased traffic associated with the terminal location. A gate would be placed at Angel Lane for emergency response only.

The rental car ready/return lot would be located adjacent to the baggage claim/rental car areas within the passenger terminal for quick and easy access. The terminal curb front shown allows for separation of commercial vehicles (taxis, hotel shuttles, etc.) and private vehicles onto separate curb front areas.

The preliminary floor plan for all three build alternatives is shown in **Exhibit 5.8** and meets the program needs for PAL 3 and PAL 5.

Airfield efficiency and safety measures at this site were discussed and considered in detail. See the Safety Risk Management Documentation (SRMD) found in **Appendix H** for details on the hazards, risks and mitigations determined as necessary to achieve an acceptable level of safety and efficiency for this alternative.

For the airfield efficiency / safety criterion, this site is considered similar to the existing site; however, with the one exception that the fueler truck would have to access this site along Taxiway A. To mitigate this potential fuel truck to aircraft conflict, an access road between the existing apron and the new apron will be constructed.

Airfield access would be provided by new connections to Taxiway A from a new parking apron.

This site also does not have the security and safety risks of co-located airline and GA operations.

The ARFF building would be adjacent, but separated from the main passenger terminal to the south, for this alternative. A preliminary response time calculation indicates that ARFF response vehicles at the Alternative 5 site can reach the midpoint of the furthest runway (Runway 2-20) within 3 minutes from time of alarm. See **Appendix C** for details.

This site was also checked for the ATCT's Line-of-sight to compare against the existing site's baseline. See **Exhibit 5.15** and **5.15C**. The minimums for line-of-sight are met from the tower to this alternative location.

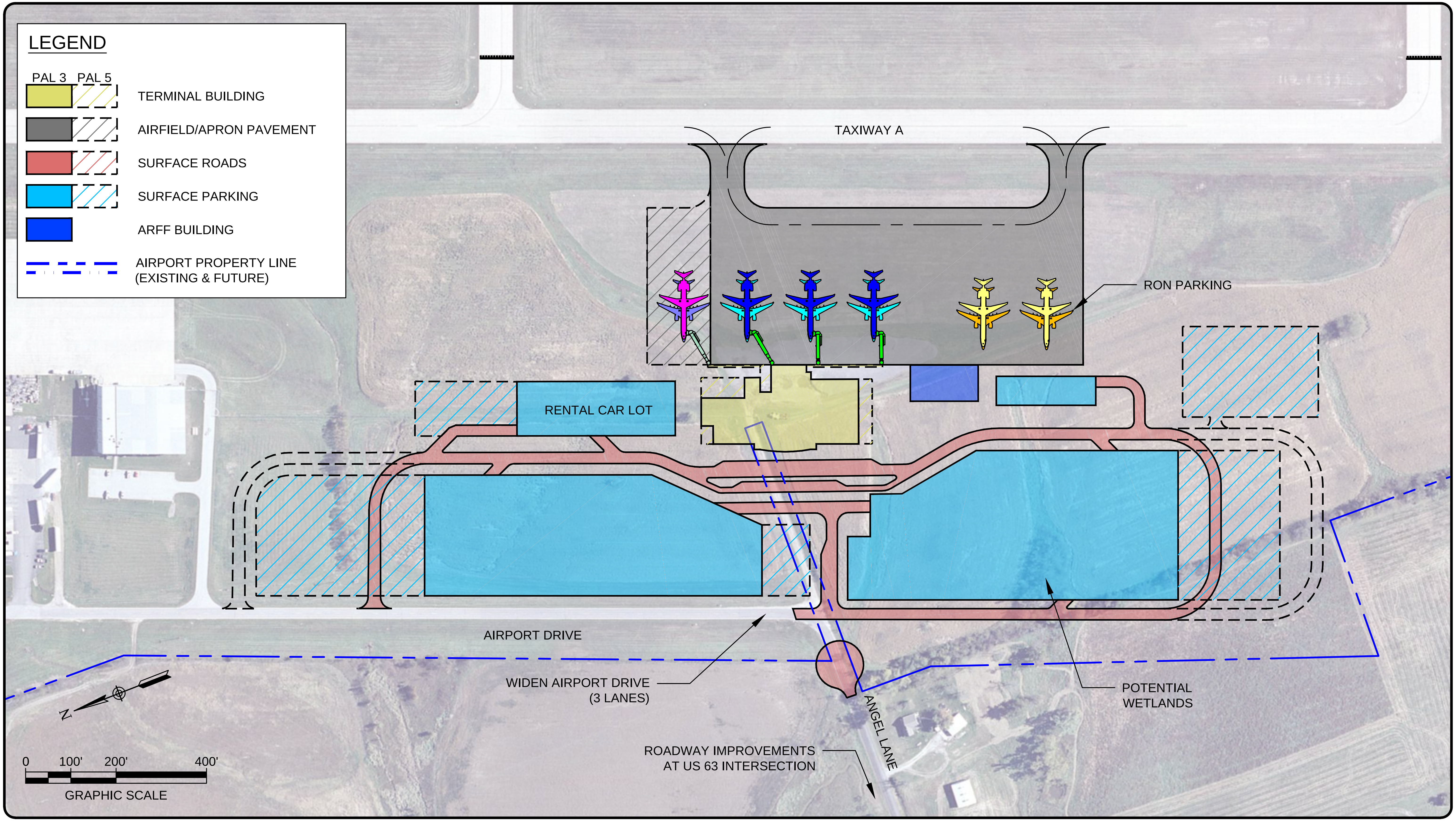
Landside efficiency and safety were also reviewed for this alternative location. The passenger terminal, access roadways, and vehicular parking facilities are all located outside the ultimate RPZs of the primary runway. Providing for two expandable large parking areas at this location provides for an easy means of revenue and access control as well as easily identified pedestrian zones within the parking complex.

Airspace for each alternative site was reviewed for TERPS and Part 77 airspace criteria. See **Appendix I** for OEAAA submitted material and FAA determination/objections. No negative impacts are anticipated for this site. See **Exhibit 5.18**.

Constructability and the phasing of this alternative is away from all active operations.

The overall costs of this alternative are presented in more detail in **Appendix F**.

Exhibit 5.10A Alternative 5: Site Overview Parallel Layout



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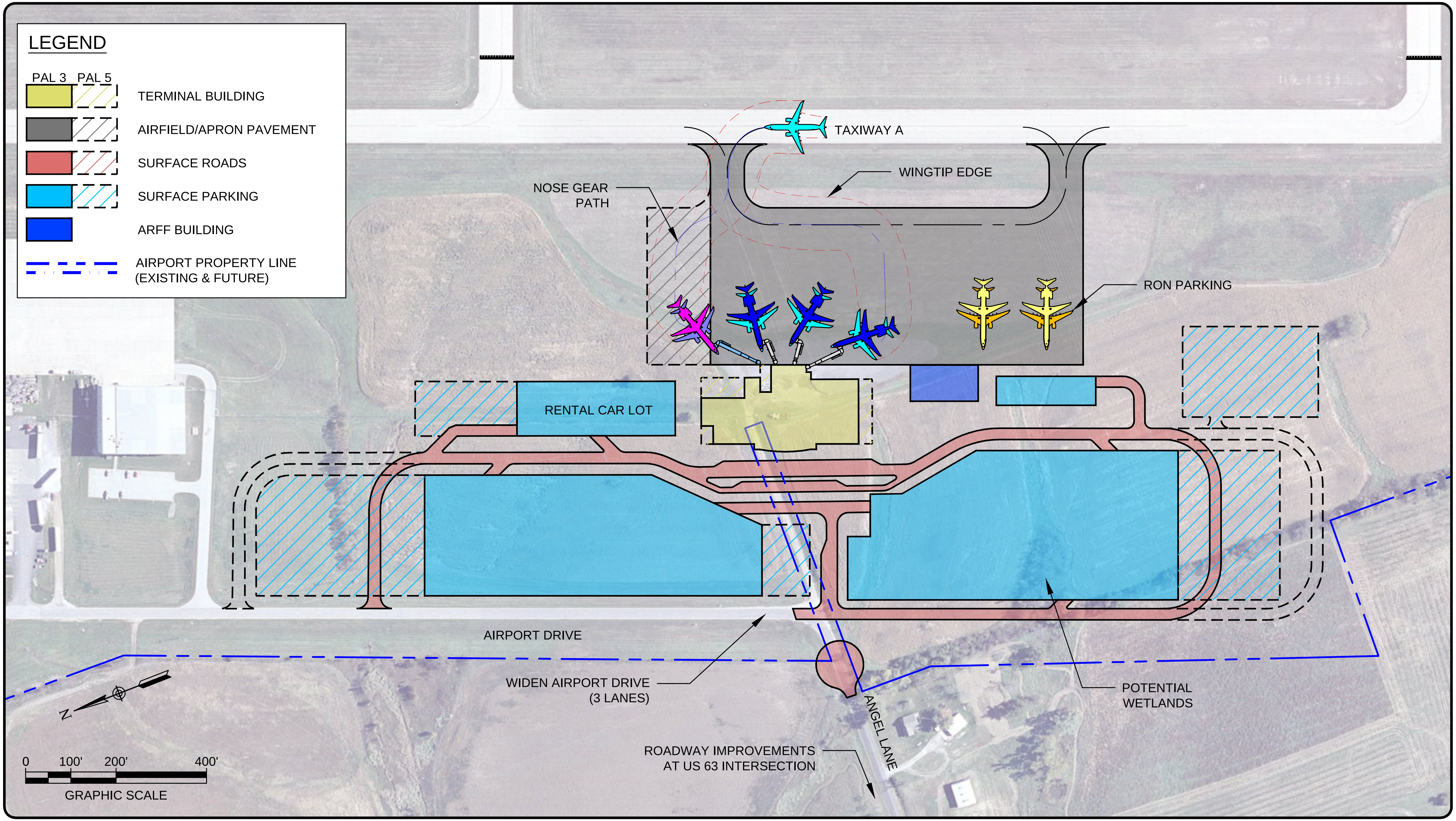
ALTERNATIVE 5: SITE OVERVIEW
PARALLEL LAYOUT

EXHIBIT
5.10A

Exhibit 5.10B Alternative 5: Site Overview Radial Aircraft Layout



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ALTERNATIVE 5: SITE OVERVIEW
RADIAL AIRCRAFT LAYOUT

EXHIBIT
5.10B

5.6 Evaluation of Alternatives

Alternatives 1, 2, and 5 were evaluated along with the No-Build alternative using the five criteria described in Section 5.4.1. The following subsections provide an in-depth description of all alternatives considered based on each individual evaluation criteria.

5.6.1 Meets Terminal Program Requirements

Table 5.2 depicts the results of the Meets Terminal Program Requirements evaluation.

Table 5.2 Meets Terminal Program Requirements Evaluation

Criterion	Alternative 1	Alternative 2	Alternative 5	No-Build Alternative
Meets Terminal Program Requirements	🟢	🟢	🟢	🔴
Ratings	🟢 *Excellent*	🟩 *Good*	🟡 *Satisfactory*	🟠 *Unsatisfactory* 🔴 *Poor*

Source: WSP analysis, 2017.

All three build alternatives are rated excellent for their individual ability to meet the PAL 3 terminal program requirements. All of the build alternatives include significant levels of development which will support the facility requirements developed in Chapter 4. The No-Build alternative was rated poor for its inability to meet the terminal facility requirements and provide for future growth over the planning period.

5.6.2 Long Term Needs and Future Flexibility

Table 5.3 depicts the results of the Long Term Needs and Future Flexibility evaluation.

Table 5.3 Long Term Needs and Future Flexibility Evaluation

Criterion	Alternative 1	Alternative 2	Alternative 5	No-Build Alternative
Long Term Needs	🟢	🟢	🟢	🔴
Future Flexibility	🟡	🟢	🟡	🔴
Overall Rating	🟩	🟢	🟩	🔴
Ratings	🟢 *Excellent*	🟩 *Good*	🟡 *Satisfactory*	🟠 *Unsatisfactory* 🔴 *Poor*

Source: WSP analysis, 2017.

All three build alternatives are rated excellent for Long Term Needs for their ability to meet PAL 5 terminal program requirements. The No-Build alternative was rated poor for its inability to meet the terminal facility requirements.

Alternative 1 was rated satisfactory for Future Flexibility due to its constrained location on the airfield surrounded by other general aviation uses. Expansion beyond four aircraft gates at this location would be difficult in that it would require the relocation of existing GA tenants on at least one side of the terminal. In addition, vehicular parking under a PAL 5 scenario would require a large amount of space in non-ideal locations for passengers, in some cases further competing with GA tenant parking as well as across Airport Drive, in order to provide the necessary parking for the terminal. Vehicular parking beyond PAL 5 would be at even greater walking distances from the terminal. A parking structure would mitigate many of these issues by consolidating parkers and shortening walking distances, providing for controlled pedestrian zones for safer walking paths, providing parking beyond PAL 5 facility requirements, and minimizing impacts to GA tenants. This consideration produced the overall rating for Alternative 1 in this criterion between good and satisfactory.

Alternative 2 was rated excellent for Future Flexibility based on its ability to provide multiple options for expansion for aircraft parking, vehicular parking, and roadway configurations should unanticipated changes occur in the industry. The overall rating in this criterion for Alternative 2 is excellent.

Alternative 5, similarly to Alternative 1, was rated satisfactory for Future Flexibility based on its limited ability to provide convenient walkable parking distances from the terminal. For this Alternative, aircraft parking can be expanded beyond 4 gates, similarly to Alternative 2. However, vehicular parking is more constrained for this Alternative than at Alternative 2 in a PAL 5 or greater scenario unless additional property is acquired, environmentally sensitive areas are disturbed or expensive parking garages (unpopular with the city residents) is constructed. Based on this, Alternative 5 was given a good overall rating for this criterion.

5.6.3 Operational Efficiency and Compatibility

The evaluation results based on Operational Efficiency and Compatibility are summarized in **Table 5.4.**

Table 5.4 Operational Efficiency and Compatibility Evaluation

Criterion	Alternative 1	Alternative 2	Alternative 5	No-Build Alternative
Airfield Operational Efficiency / Compatibility	🟢	🟩	🟢	🟢
Apron Operational Efficiency / Compatibility	🟡	🟢	🟢	🟡
Landside Operational Efficiency / Compatibility	🟠	🟢	🟠	🔴
Passenger / Baggage Through-put	🟢	🟢	🟢	🔴
Overall Rating	🟩/🟡	🟢	🟢/🟩	🟠
Ratings	🟢 *Excellent*	🟩 *Good*	🟡 *Satisfactory*	🟠 *Unsatisfactory*	🔴 *Poor*

Source: WSP analysis, 2017.

Airfield Operational Efficiency and Compatibility:

A Safety Risk Assessment panel was formed and a risk assessment (RA) was conducted for all three alternatives in order to specifically address identified airfield operational hazards and their associated risks. This RA was held on May 2, 2017 at Columbia Regional Airport. See **Appendix H** for the Safety Risk Management Document (SRMD) which recorded the discussions and agreement regarding residual risks after planned mitigation strategies would be implemented.

Alternative 1 was rated excellent for airfield operational efficiency and compatibility due to its central location on the primary runway.

Alternative 2 was rated good for this sub-criterion due to its location on the airfield, at the end of the primary runway, requiring crossing of Runway 13-31 for take-offs and landings. Through a Safety Risk Assessment, several mitigations were identified to address the potential risks associated with this site's location. Upon implementation of these mitigations (extending the ATCT hours of operation, providing two means of accessing the airfield from the site, and providing an access road for vehicles driving between the FBO location and the site), this alternative's residual risk were found to be acceptable.

Alternative 5 was rated excellent for airfield operational efficiency and compatibility due to its near central location on the primary runway, similar to that of Alternative 1.

For all alternatives, it was expressed by the airline partners and ATCT management that extending the hours of ATCT operation to coincide with the commercial airline operating hours was desired.

Apron Operational Efficiency and Compatibility:

Alternative 1 was rated satisfactory for apron operational efficiency and compatibility due to its location between two GA apron areas. This is due to the proximity of the general aviation tenants surrounding the proposed passenger terminal area and the potential for continuing conflicts from an aircraft movement perspective as well as the security/SIDA concerns. Additionally, given the space constraints with the proximity of the apron edge taxilane, longer commercial aircraft will be restricted to the end gates and a straight-in parking configuration (**Exhibit 5.7B**) is only possible if the terminal is pushed further into the parking area, thus reducing the available parking area directly in front of the building and requiring more parking further from the building (longer pedestrian walking distances and more conflicts between pedestrians and vehicles).

Alternative 2 and 5 are rated excellent for apron operational efficiency and compatibility due to their separation from all GA apron areas, eliminating the potential for GA to commercial aircraft conflicts. Additionally, both alternatives have adequate apron space to allow for either radial or straight-in parking configuration as well as generous space for ground service equipment (tugs, bag carts, fuel trucks, lav carts, etc). Both alternatives also minimize future impacts to existing tenants and provide additional areas for future GA development or charter operations at the location of the current terminal area.

Landside Operational Efficiency and Compatibility:

Alternative 1 was rated unsatisfactory for landside operational efficiency and compatibility due to its location between two GA tenants (sharing parking areas), restriction by Airport Drive for future expansion requiring future parking to be further north or south of the building (longer pedestrian walking distances), parking layout requiring pedestrians to walk across Airport Drive (more conflicts between pedestrians and vehicles), and difficulty in providing access control for future parking revenue, if so desired in the future.

Alternative 2 was rated excellent for landside operational efficiency and compatibility due to its expansion envelop and ability to provide multiple options for parking, rental car, and loop road/access control as the industry changes and requirements change with it. Additionally, this alternative provided for a compact parking arrangement (shortest walking distance of all three alternative) that could be developed such that pedestrian zones within the parking complex are easily identifiable and safe from vehicle movements.

Alternative 5 was rated unsatisfactory for landside operational efficiency and compatibility due to its more limited expansion envelop, longer walking distances, lack of compatibility to adjacent residential homes, the further driving distance to its location along Airport Drive, and its proximity to residential homes on Angel Lane.

Terminal Passenger and Baggage Through-put:

All three alternatives can accommodate the same terminal floor plan which easily handles the passenger and baggage through-put needed for PAL 3, PAL 5 and is also expandable to serve enplanement activities beyond PAL 5. The No-Build Alternative was rated poor for terminal passenger and baggage through-put.

The overall rating for each alternative was determined by averaging the ratings for the sub-criterion of this criterion.

5.6.4 Cost Effectiveness and Ease of Implementation

The evaluation results based on Operational Efficiency and Compatibility are summarized in **Table 5.5**.

Table 5.5 Cost Effectiveness and Ease of Implementation Evaluation

Criterion	Alternative 1	Alternative 2	Alternative 5	No-Build Alternative
Cost Effectiveness	🟢	🟡	🟩	🟢
Ease of Implementation	🟠	🟢	🟩	🟢
Overall Rating	🟩🟡	🟩	🟩	🟢
Ratings	🟢 *Excellent*	🟩 *Good*	🟡 *Satisfactory*	🟠 *Unsatisfactory* 🔴 *Poor*

Source: WSP analysis, 2017.

Rough order of magnitude (ROM) costs were developed for Alternatives 1, 2, and 5 based on the site overviews and floor plans shown in Exhibits 5.7 through 5.13. Total project costs for an opening day scenario (assumed to be approximately PAL 2) for each of the build alternatives are estimated at (and includes the mitigation measures discussed at length in Section 5.4 – see **Appendix F** for detailed cost estimates):

- Alternative 1: $32.8 million
- Alternative 2D: $41.8 million
- Alternative 5: $37.5 million

The City has long planned for a $40 million program cost as a target budget but have been working hard to securing the funding necessary for the program should its costs exceed this initial budgetary number. Based on the opening day ROM costs, Alternative 1 was rated excellent (as it is 20% below budgeted figures), Alternative 2 was rated satisfactory (less than 5% within budgeted figures), and Alternative 5 was rated good (within 10% of budgeted figures) for cost effectiveness.

The No-Build alternative assumes no improvements would be made at the terminal, so from a purely capital expenditure standpoint, this alternative is excellent in its costs. However, costs such as for continued maintenance, replacement or emergency repairs was not factored into this evaluation.

Based upon feedback from airline partners, the Technical and Citizen Advisory Committee meetings, and the City Council, Alternative 1 was rated unsatisfactory for ease of implementation due to the difficulty to phase construction around existing terminal operations. Passengers could expect several years of construction activity in order to maintain active commercial operations at the Airport during implementation. Existing general aviation tenants on either side of the passenger terminal would also experience impacts during construction of a replacement terminal on the landside and potentially on the airside depending on construction phasing and methods. Overall for this criterion, Alternative 1 was rated good to satisfactory.

Alternative 2 was rated excellent for ease of implementation. Alternative 5 was rated good for ease in implementation due to the amount of construction traffic that would co-mingled with passenger traffic on Airport Drive as well as compatibility impacts to the adjacent residential homes on Angel Lane during construction (air, noise, and potentially light pollution). Both alternatives are located away from existing airport operations (both commercial and general aviation). Impacts to airfield operations would be minimal for both alternatives.

Overall for this criterion, Alternative 2 received a good rating, while Alternative 5 also received a good rating.

The No-Build alternative assumes no improvements would be made at the terminal except those needed for maintenance, repair or replacement reasons, and is therefore rated excellent for ease of implementation.

In consideration of a longer term build-out costs, costs to expand for additional enplanement activities were estimated for 10 years after opening day. Facility components which were expanded include: a 4,800 SF addition to the hold room, baggage claim expansion, surface parking additions, and assumed new hangar construction to look at how each site impacts overall development costs on the airport. Estimates, all within approximately 10% of each other, were as follows:

- Alternative 1: $54.1 million (all surface parking)
- Alternative 2D: $60.4 million
- Alternative 5: $56.9 million (all surface parking)

However, as discussed previously in this chapter, landside conditions and operational efficiency is reduced by increased walking distances for Alternative 1 and 5 in PAL 5. Additionally, the parking layouts for both of the sites places pedestrians at greater risk with vehicle conflicts due to the fact that expanded parking areas will be across Airport Drive (Site 1) or potentially restricted by environmental factors (both Site 1 and 5). Mitigation to these risks includes use of a parking garage to concentrate parking in a more convenient distance to the terminal and to control pedestrian movements more so to eliminate vehicle to pedestrian conflicts along Airport Drive.

In consideration of a longer term build-out costs, costs to expand for additional enplanement activities were estimated for 10 years after opening day. Facility components which were expanded include: a 4,800 SF addition to the hold room, baggage claim expansion, parking additions via construction of a multi-story parking garage (for Site 1 and 5 which are constrained sites, Site 2 has sufficient room to provide more parking with surface parking), and assumed new hangar construction to look at how each site impacts overall development costs on the airport. Estimates were as follows:

- Alternative 1: $71.7 million (with a multi-story parking garage)
- Alternative 2D: $60.4 million
- Alternative 5: $74.5 million (with a multi-story parking garage)

These longer term (beyond PAL 5 for parking) and hangar costs were not evaluated quantitatively in the evaluation between the three sites.

5.6.5 Environmental Compatibility

Table 5.6 displays the results of the environmental compatibility evaluation.

Table 5.6 Environmental Compatibility Evaluation

Criterion	Alternative 1	Alternative 2	Alternative 5	No-Build Alternative
Environmental Compatibility	🟡	🟡	🟡	🟢

Ratings	🟢 *Excellent*	🟩 *Good*	🟡 *Satisfactory*	🟠 *Unsatisfactory*	🔴 *Poor*

Source: WSP analysis, 2017.

Alternative 1 expands the footprint of the parking envelope on the west side of Airport Drive to the current airport property line. A US Army Corps of Engineers permit and grading easement may be required as development reaches the forested area along the property line. Aircraft and vehicular parking would be located in areas currently being used for those activities. As a result, the impact to existing residential areas due to noise is anticipated to be negligible. Given the limited development envelope available for Alternative 1, there is little room to provide for sustainable environmental features outside the terminal building itself. Based on this, Alternative 1 was rated satisfactory for environmental compatibility.

Alternative 2 is contained completely on current airport property. The closest residence is across Route H from the proposed entrance road. However, it is located at a significant distance from the aircraft parking area, so aircraft noise is not anticipated to be significant. The development footprint of Alternative 2 is the largest of the three build alternatives. Given that large footprint, Alternative 2 is the most capable of the three build alternatives in the ability to provide areas for sustainable infrastructure and features offsetting and mitigating the effect of the overall land area impact of this alternative. A preliminary site assessment was conducted for this area to investigate for wetlands and other waterbodies. Three potential wetland areas were identified in the area under consideration for Alternative 2. The layout as shown in **Exhibit 5.9** would potentially impact 1.9 acres of the wetland areas. As a result, Alternative 2 was given an initial rating of satisfactory for environmental compatibility. The orientation of the site layout for Alternative 2 can be modified to avoid impacting the potential wetland areas while still meeting the program needs, which would result in an improved rating in this category should it selected as the preferred site. See **Exhibit 5.11**, **5.12A and 5.12E**.

Alternative 5 has aircraft and vehicular parking located within 1,000 feet of the nearest residence along Angel Lane. Noise and light impacts to the residential area adjacent to this site are a negative impact. Earthwork and grading impacts during construction would also likely be the highest of the three build alternatives. Increased traffic along Angel Lane of both delivery trucks and passenger vehicles is also likely for this alternative but will be mitigated by creating Angle Lane as a cul-de-sac. This will have residual impacts in that emergency response from Ashland will be slowed at the cul-de-sac to enter to the airport property through a gate. From a sustainability perspective, Alternative 5 is as constrained from a footprint perspective as Alternative 1, and would be difficult to find areas to provide sustainable infrastructure and features near the terminal. As a result, Alternative 5 was rated satisfactory for environmental compatibility.

The No-Build alternative assumes no improvements would be made at the terminal except those needed for maintenance, security, or safety reasons, and is therefore rated excellent.

5.6.6 Evaluation Summary

Alternatives 1, 2, and 5 were evaluated along with a No-Build Alternative using the five criteria described above. As shown in **Table 5.7**,

Table 5.7 Overall Alternatives Evaluation

Criterion	Alternative 1	Alternative 2	Alternative 5	No-Build Alternative
Meets Terminal Program Requirements	🟢	🟢	🟢	🔴
Long Term Needs and Future Flexibility	🟩	🟢	🟩	🔴
Operational Efficiency and Compatibility	🟩🟡	🟢	🟩	🟠
Cost Effectiveness and Ease of Implementation	🟩🟡	🟩	🟩	🟢
Environmental Compatibility	🟡	🟡	🟡	🟢
Overall Rating	🟩🟡	🟢🟩	🟩	🟡
Ratings	🟢 *Excellent*	🟩 *Good*	🟡 *Satisfactory*	🟠 *Unsatisfactory*	🔴 *Poor*

Source: WSP analysis, 2017.

5.7 Preferred Alternative

The selection of a preferred alternative was made by the City using the feedback of the City Council, Technical and Citizens Advisory Committees, feedback from the Interested Parties Meeting, feedback from the airline stakeholders and the results of the alternatives evaluation analysis.

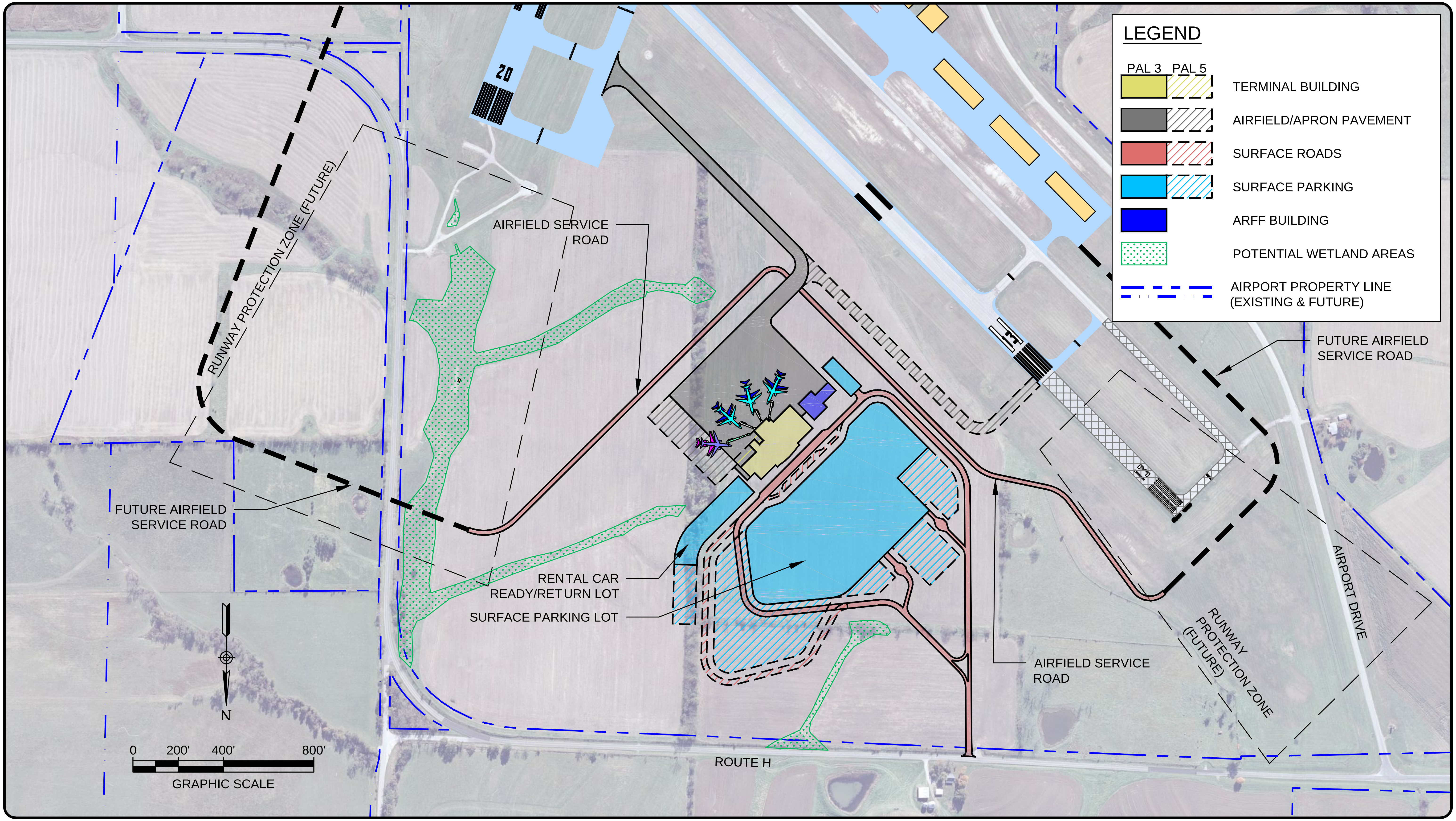
Alternative 2 is recommended as the preferred alternative to serve passenger terminal needs at the Airport. Alternative 2 provides the maximum opportunity and flexibility to meet demand at both PAL 3 and PAL 5 and beyond. Unanticipated changes in the aviation industry and activity levels at the Airport can be more easily accommodated at the location for Alternative 2. The greenfield location provides for a permanent separation of general aviation and commercial operations, presents the fewest impediments to existing aircraft operations during construction, and provides the greatest opportunity for sustainable infrastructure and features on-site. Airfield operational efficiency and safety concerns expressed by the airline partners and FAA (see **Appendix H** for documentation of the Safety Risk Assessment panel and analyses) have been mitigated through a planned extension of the ATCT hours, an access road for fuel trucks around the crosswind runway, and by providing connection of the apron for Opening Day to Taxiway Alpha as well as Taxiway C. Alternative 2 also minimizes future impacts to existing tenants and provides additional areas for future GA development or charter operations at the location of the current terminal area.

Alternative 2 corresponds to the highest cost alternative analyzed for the PAL 2 or Opening Day scenario, primarily due to the added infrastructure needed in relocating terminal operations to the northwest airfield (new apron, taxiway, access roads, and parking lots). To reduce initial phase construction costs and to remove any impacts to the assumed wetland areas on the site, refinements to the orientation, construction phasing, taxiway connectivity and aircraft parking apron extents were made during a refinement of Alternative 2. **Exhibit 5.12E** depicts the final preferred alternative site overview (Site 2D).

Alternative 2 remains the highest costed alternative (but within approximately a 10% differential) when considered for PAL 3 (or 10-years after Opening Day) scenario. The prior master plan identified the potential need for more than 16 GA hangars on the airfield by 2020. Existing GA tenants adjacent to the existing terminal area have, during Technical Advisor Committee meetings, expressed a need to expand at their current sites with more hangars but are restricted in doing so due to the existing terminal. Conservatively, 2 to 4 new hangars were considered in PAL 3 costs and can be located at the existing site. Building the new hangars at the southwest apron area as per the previous master plan would result in a higher costs (due to site improvements and grading) than if the existing terminal was demolished and that location be the site of the new hangars (see **Exhibit 5.16**).

Chapter 6 will present an environmental overview of this proposed action and will identify potential impacts from the preferred airport alternative. Chapter 7 will present a proposed implementation plan for the development identified in the preferred alternative and a financial plan addressing the financial viability of implementing the preferred alternative.

Exhibit 5.11 Original Site 2 Preferred Alternative



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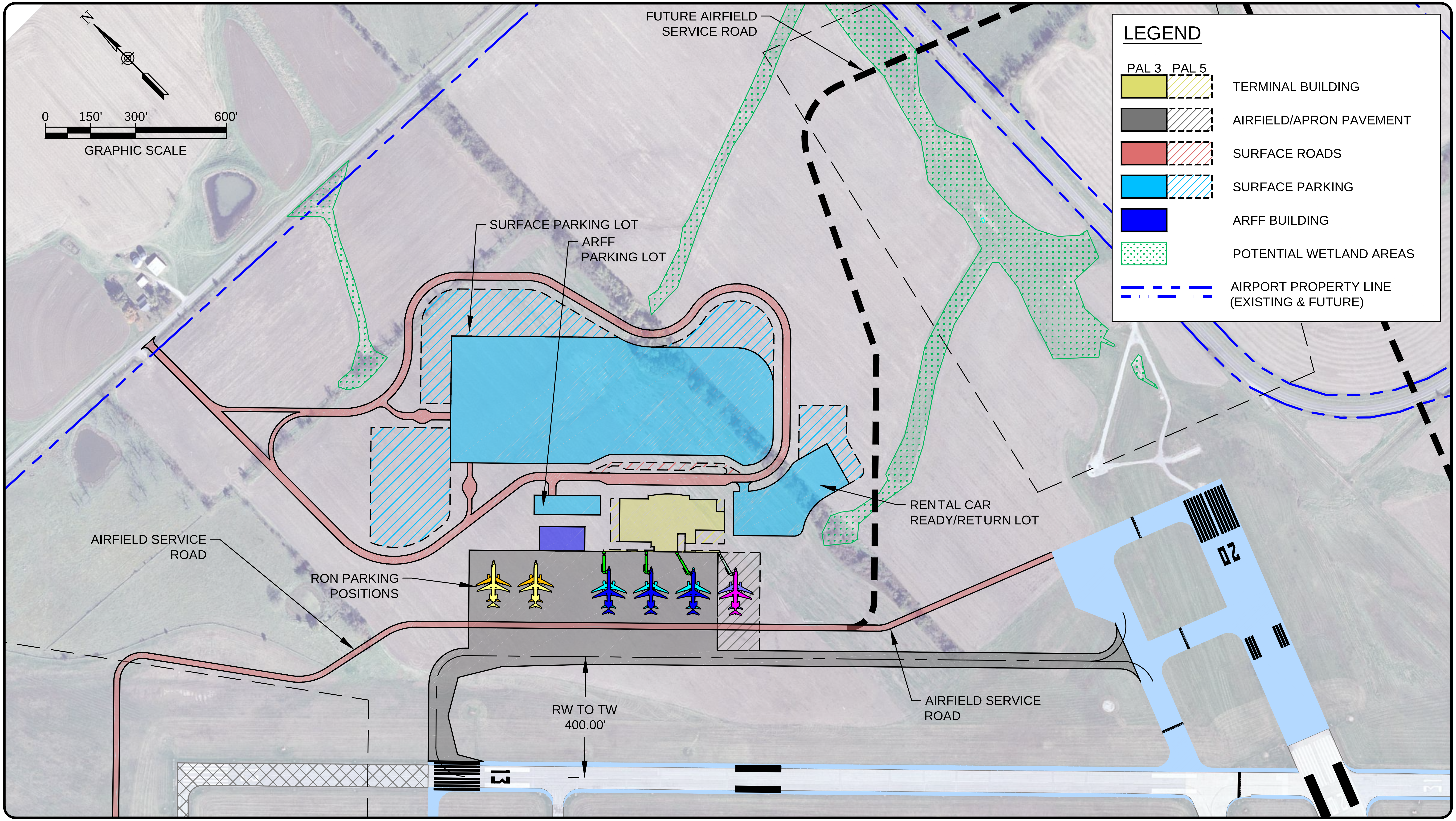
ORIGINAL SITE 2 PREFERRED ALTERNATIVE

EXHIBIT
5.11

Exhibit 5.12A Alternative 2C: Site Overview Parallel Aircraft Layout



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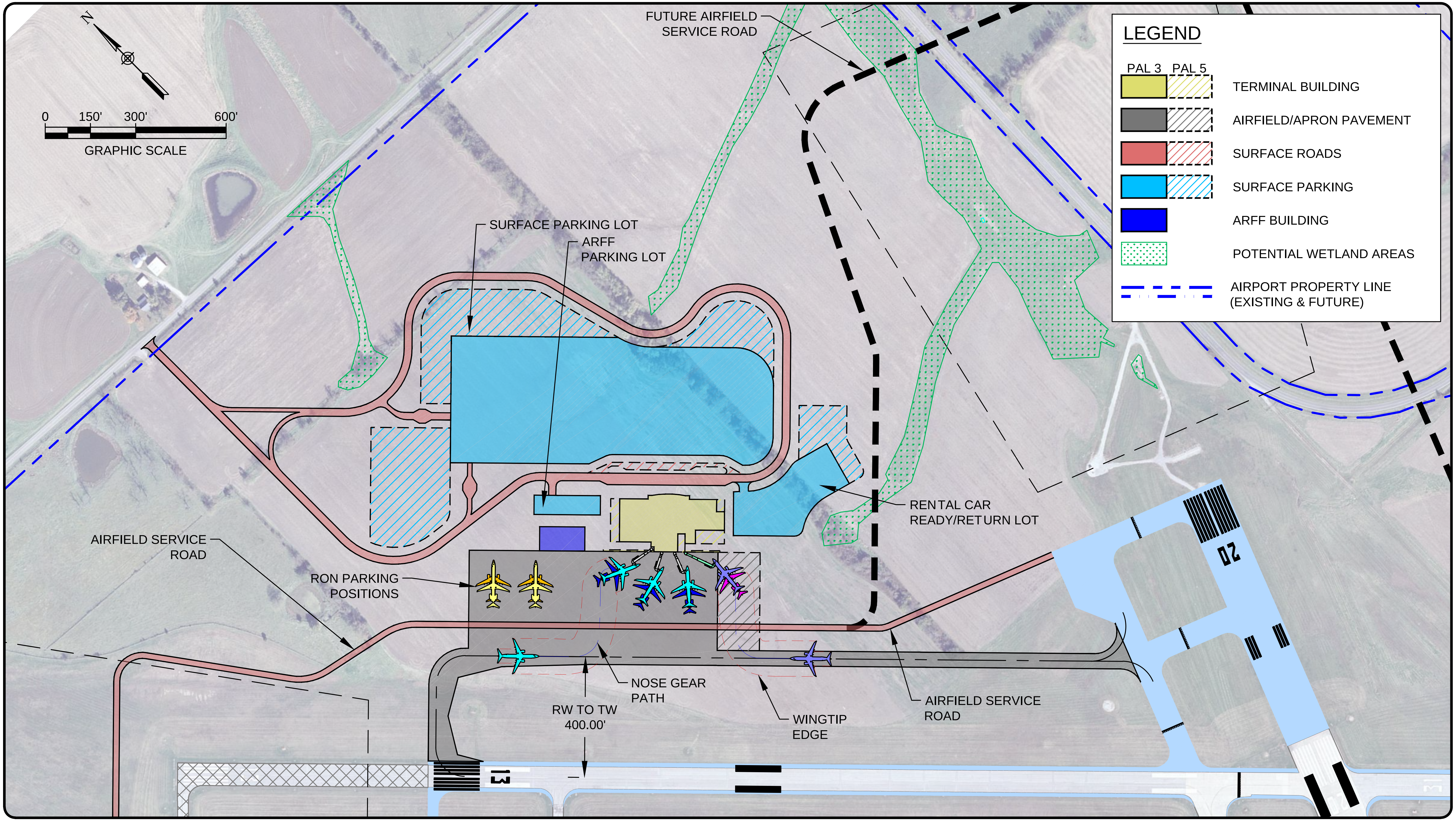
ALTERNATIVE 2C: SITE OVERVIEW
PARALLEL AIRCRAFT LAYOUT

EXHIBIT
5.12A

Exhibit 5.12B Alternative 2C: Site Overview Radial Aircraft Layout



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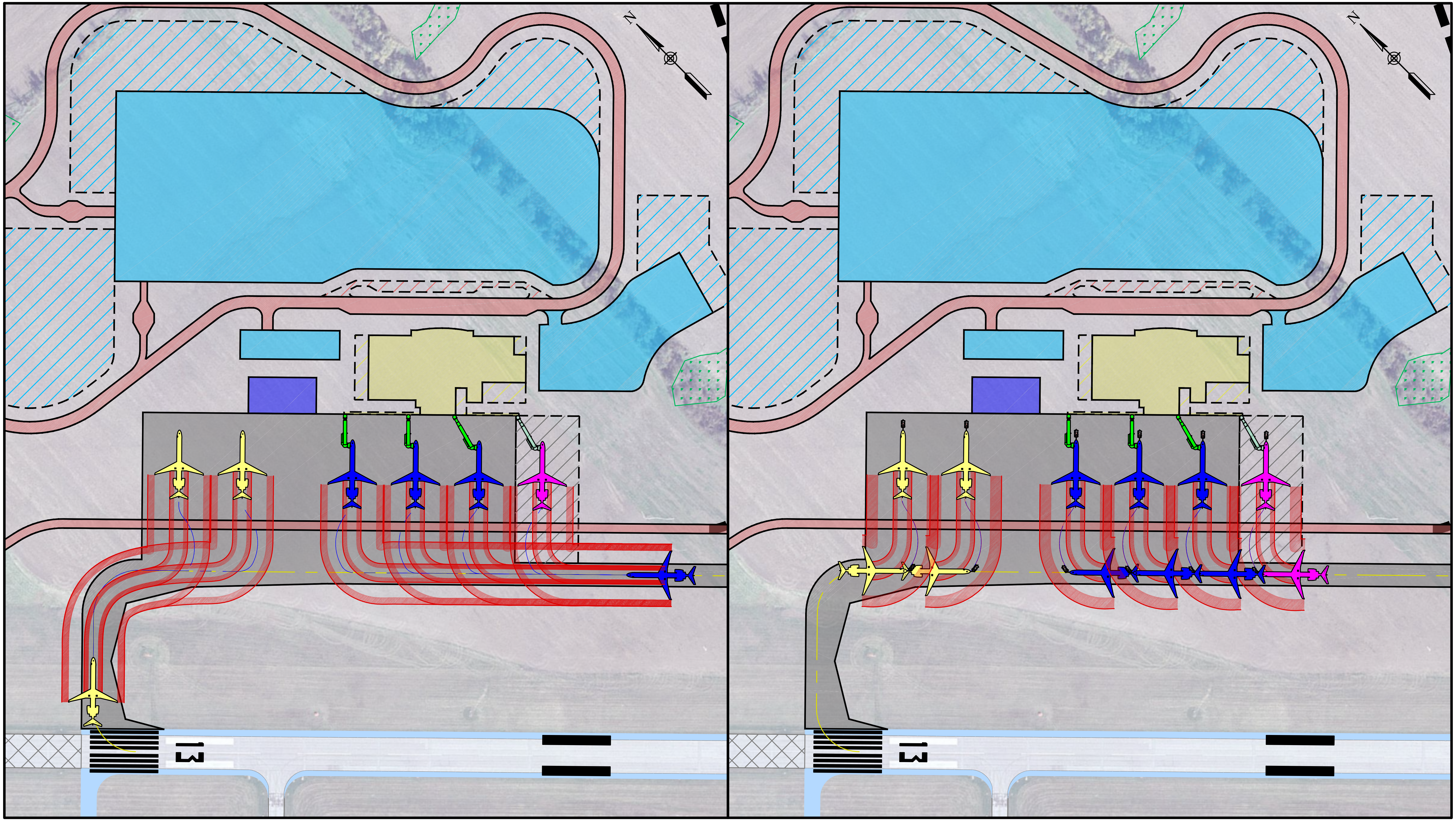
ALTERNATIVE 2C : SITE OVERVIEW
RADIAL AIRCRAFT LAYOUT

EXHIBIT
5.12B

Exhibit 5.12C Alternative 2C: MD90-30ER Power in and Push Back Maneuvers



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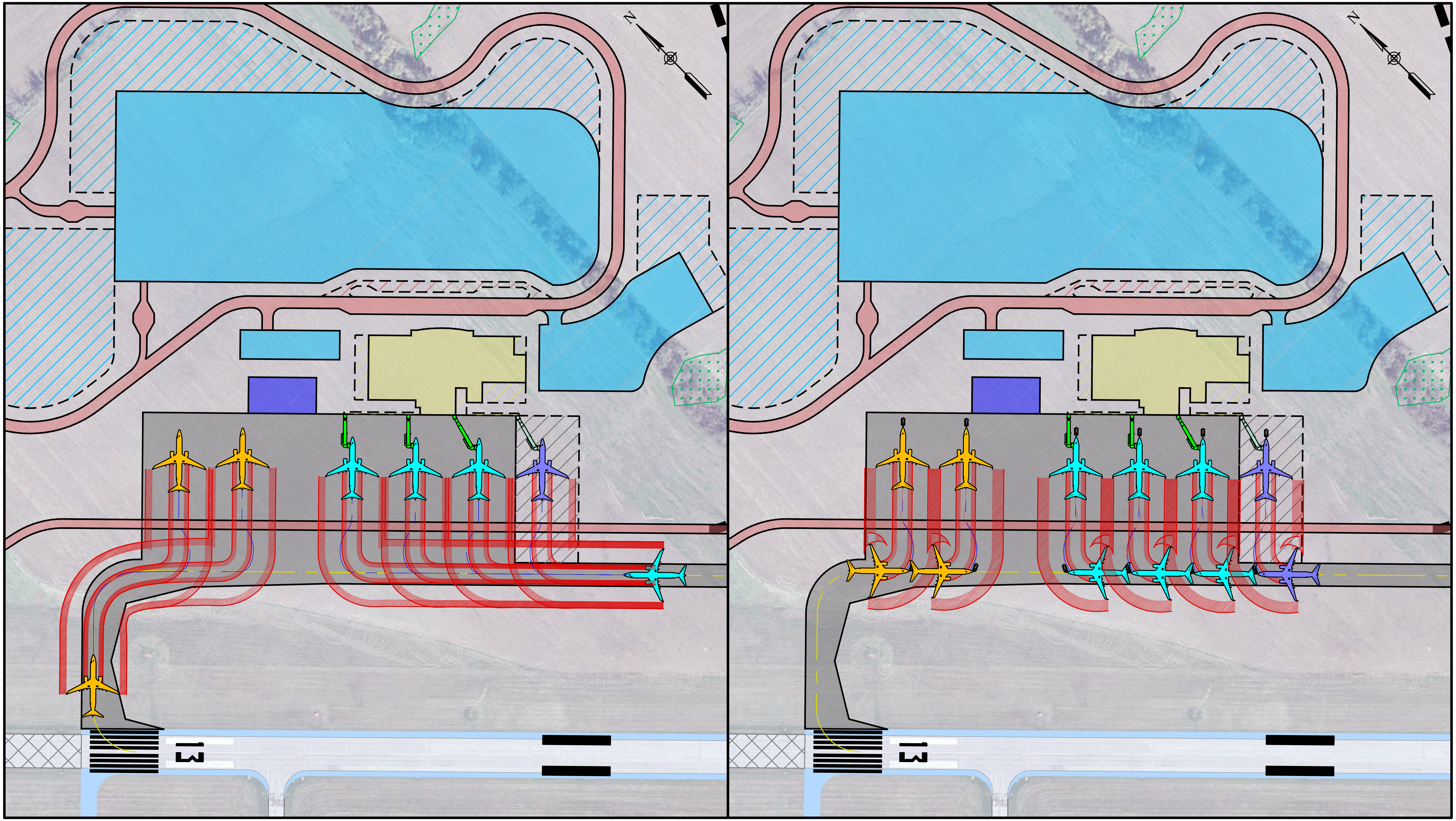
ALTERNATIVE 2C
MD90-30ER POWER IN AND PUSH BACK MANEUVERS

EXHIBIT
5.12C

Exhibit 5.12D Alternative 2C: B737-900 Power in and Push Back Maneuvers



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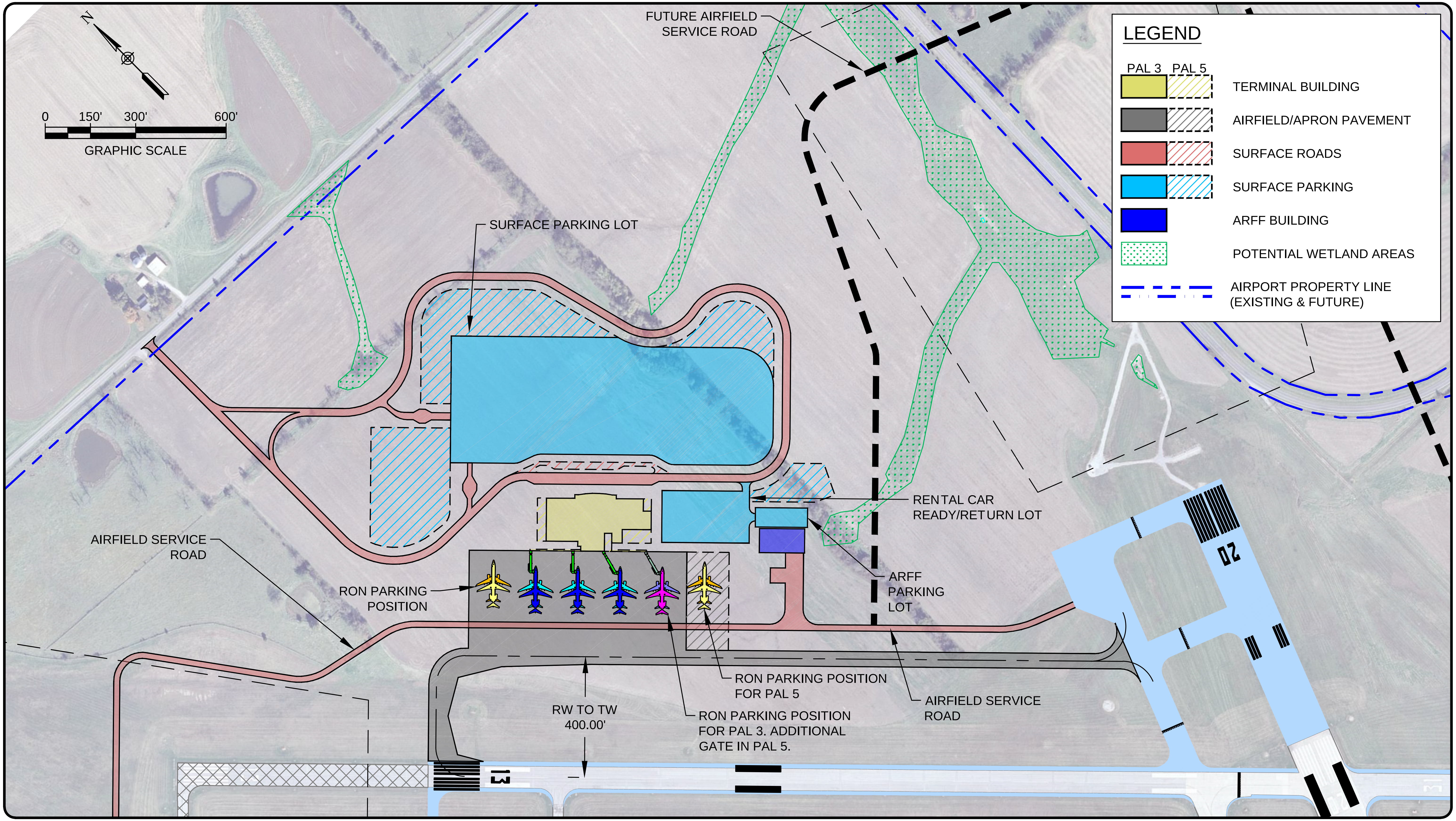
ALTERNATIVE 2C
B737-900 POWER IN AND PUSH BACK MANEUVERS

EXHIBIT
5.12D

Exhibit 5.12E **Final Preferred Alternative: Site 2D Parallel Aircraft Layout**



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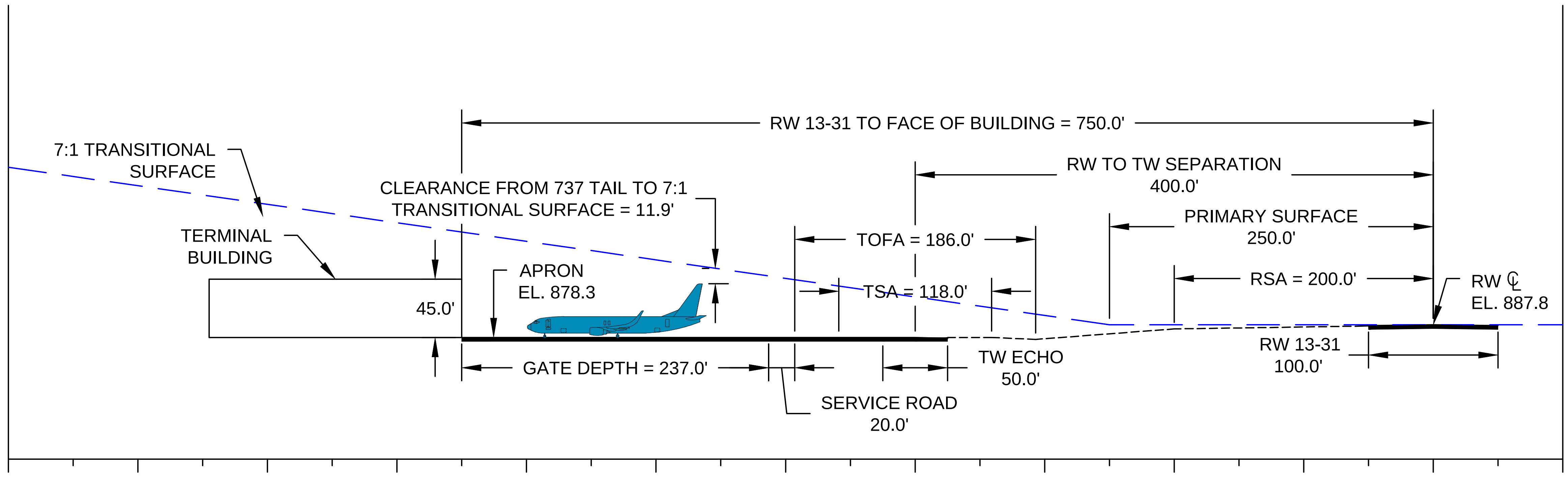
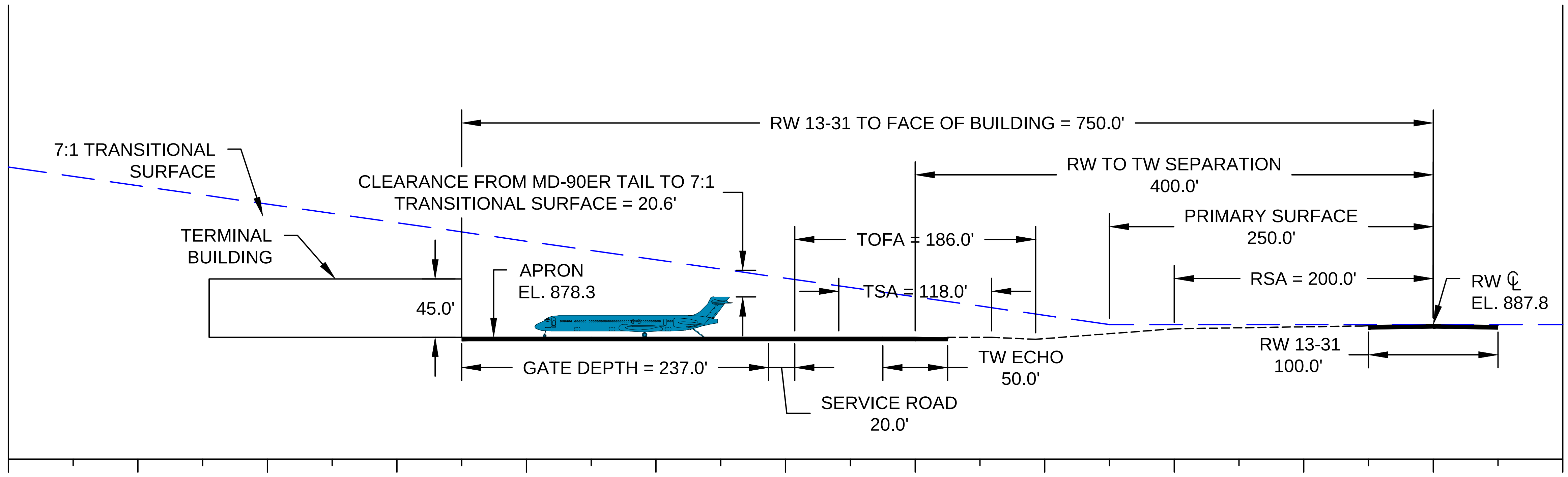
FINAL PREFERRED ALTERNATIVE: SITE 2D
PARALLEL AIRCRAFT LAYOUT

EXHIBIT
5.12E

Exhibit 5.13 ***Alternative 2C Similar to Preferred Alternative Site 2D: Cross Sectional View through RW 13-31 to terminal***





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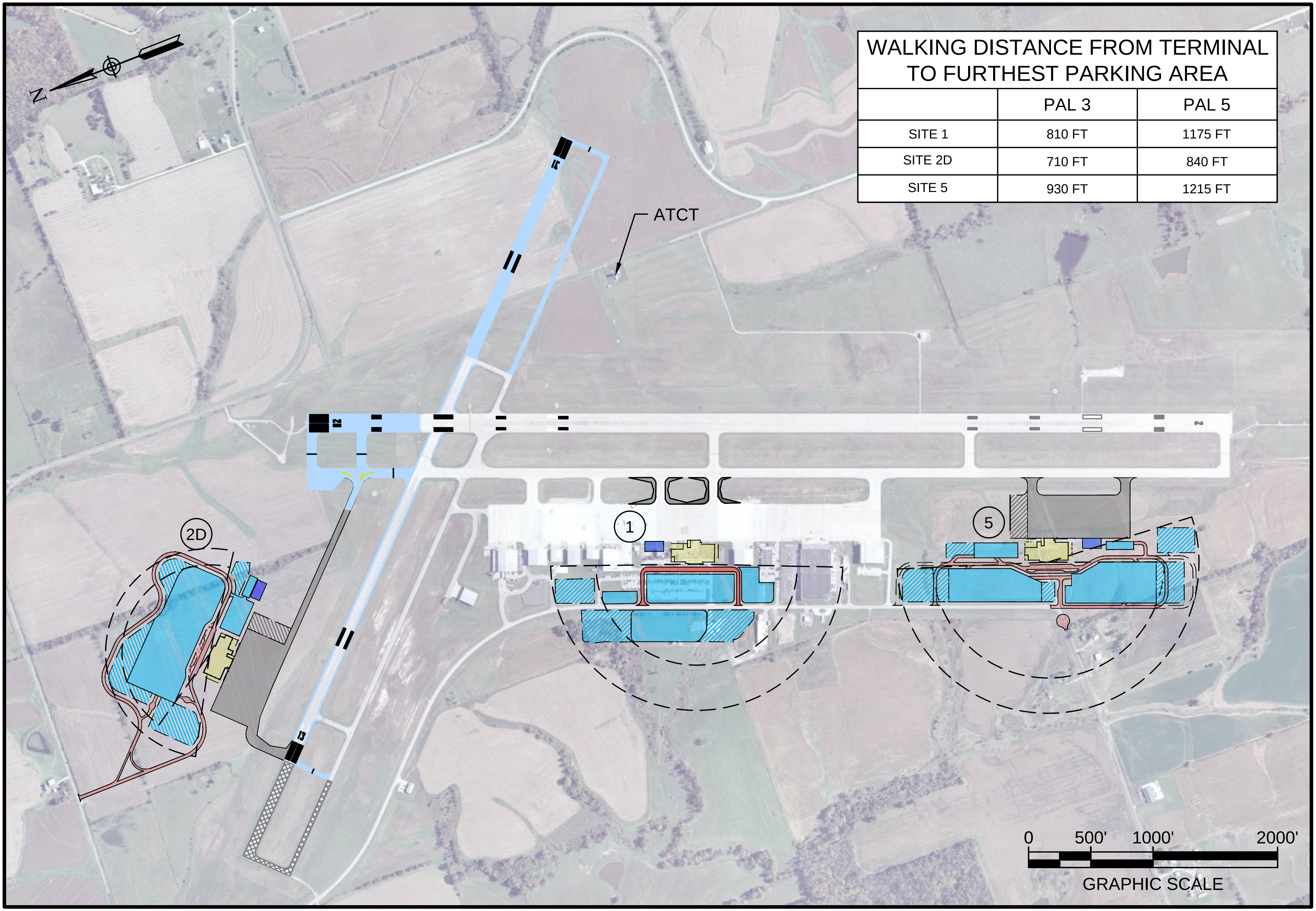
ALTERNATIVE 2C SIMILAR TO PREFERRED ALTERNATIVE SITE 2D CROSS SECTIONAL VIEW THROUGH RW 13-31 TO TERMINAL

EXHIBIT
5.13

Exhibit 5.14 Passenger Walking Distances



WALKING DISTANCE FROM TERMINAL TO FURTHEST PARKING AREA

	PAL 3	PAL 5
SITE 1	810 FT	1175 FT
SITE 2D	710 FT	840 FT
SITE 5	930 FT	1215 FT

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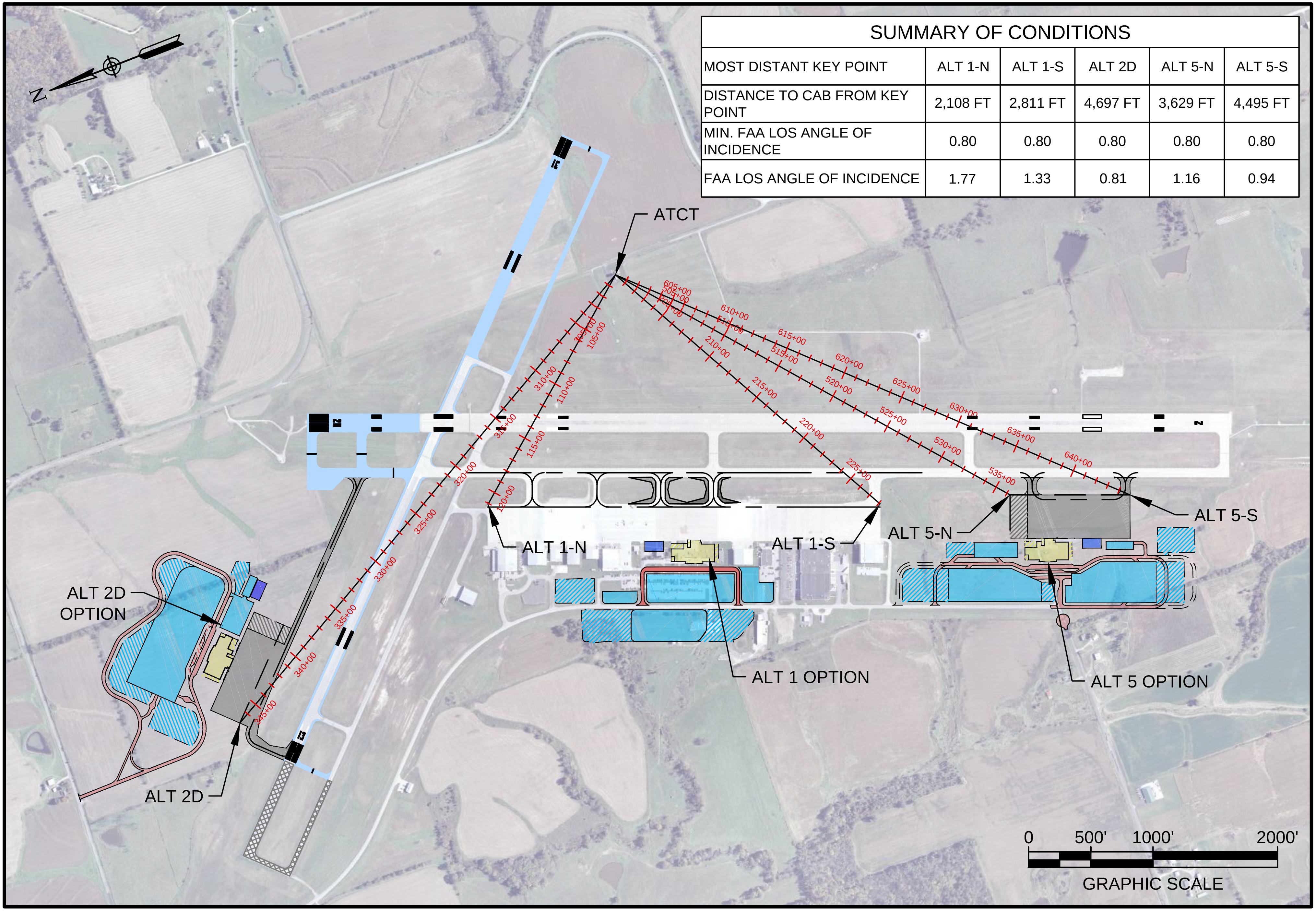
TERMINAL AREA MASTER PLAN

PASSENGER WALKING DISTANCES

EXHIBIT
5.14

Exhibit 5.15 Line-of-Sight from ATCT to Alternate Terminal Options



SUMMARY OF CONDITIONS

MOST DISTANT KEY POINT	ALT 1-N	ALT 1-S	ALT 2D	ALT 5-N	ALT 5-S
DISTANCE TO CAB FROM KEY POINT	2,108 FT	2,811 FT	4,697 FT	3,629 FT	4,495 FT
MIN. FAA LOS ANGLE OF INCIDENCE	0.80	0.80	0.80	0.80	0.80
FAA LOS ANGLE OF INCIDENCE	1.77	1.33	0.81	1.16	0.94

COLUMBIA Regional Airport

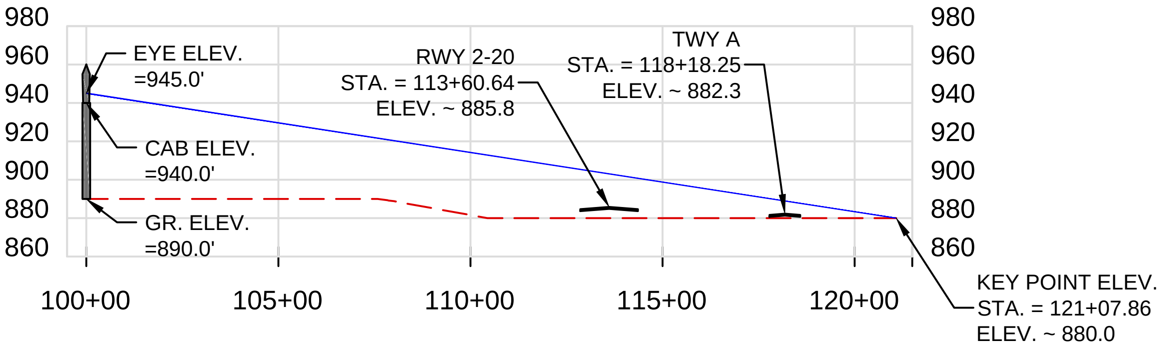
COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

Line of Sight from ATCT to Alternate Terminal Options

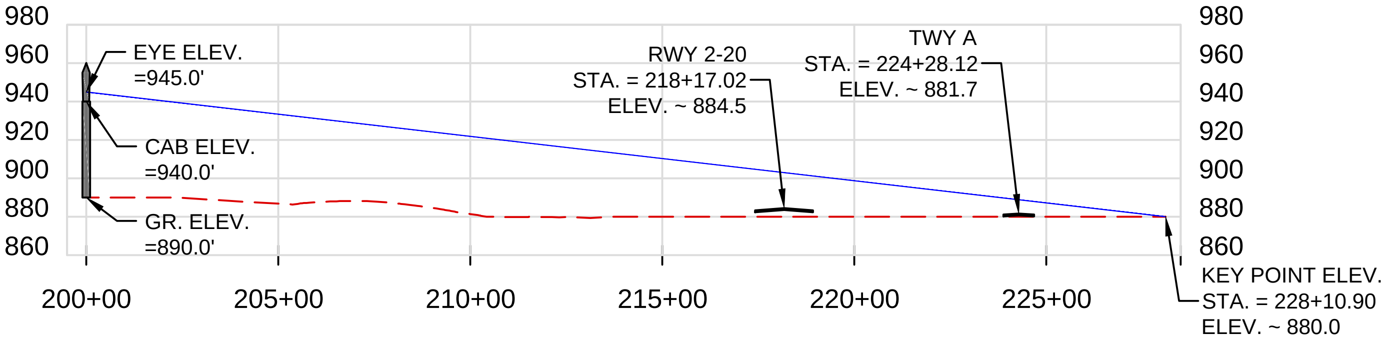
EXHIBIT
5.15

Exhibit 5.15A Alternate 1 Line of Sight from ATCT

ALT 1 - NORTH APRON EDGE PROFILE



ALT 1 - SOUTH APRON EDGE PROFILE



PROPOSED ATCT LOS - ALT 1

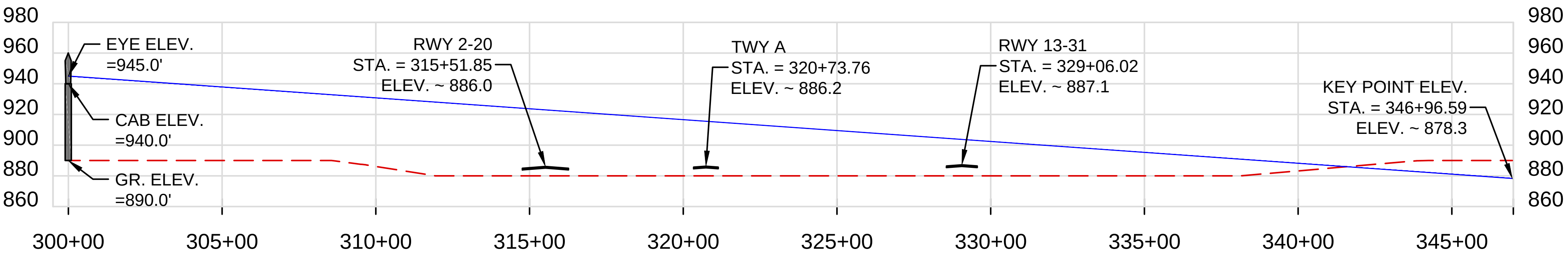
MOST DISTANT KEY POINT	NORTH APRON EDGE	SOUTH APRON EDGE
DISTANCE TO CAB FROM KEY POINT	2,108 FT	2,811 FT
FAA LOS ANGLE OF INCIDENCE	1.7700	1.3300
HEIGHT OBSERVER (H_O)	65.0	65.0
GROUND ELEVATION OF KEY POINT (P_E)	880.0	880.0
GROUND ELEVATION OF TOWER (T_E)	890.0	890.0
EYE HEIGHT ABOVE GROUND (H_C)	55	55
TOWER CAB FLOOR HEIGHT	50	50

Alternate 1 Line of Sight from ATCT

EXHIBIT
5.15A

Exhibit 5.15B Alternate 2D Line of Sight from ATCT

ALT 2D - FAR APRON EDGE PROFILE



PROPOSED ATCT LOS - ALT 2D	
MOST DISTANT KEY POINT	FAR APRON EDGE
DISTANCE TO CAB FROM KEY POINT	4,697 Ft
FAA LOS ANGLE OF INCIDENCE	0.81
HEIGHT OBSERVER (H_O)	66.7
GROUND ELEVATION OF KEY POINT (P_E)	878.3
GROUND ELEVATION OF TOWER (T_E)	890.0
EYE HEIGHT ABOVE GROUND (H_C)	55
TOWER CAB FLOOR HEIGHT	50

COLUMBIA Regional Airport

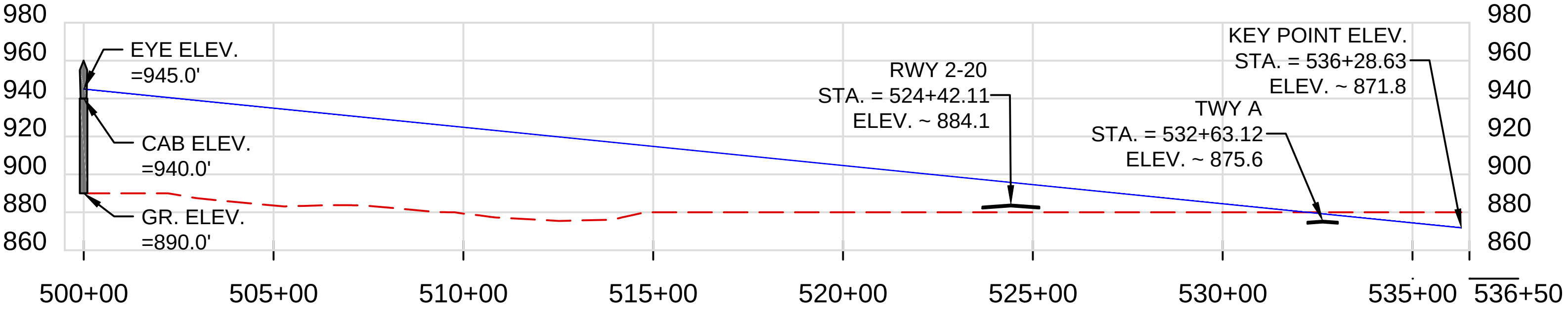
COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

Alternate 2D Line of Sight from ATCT

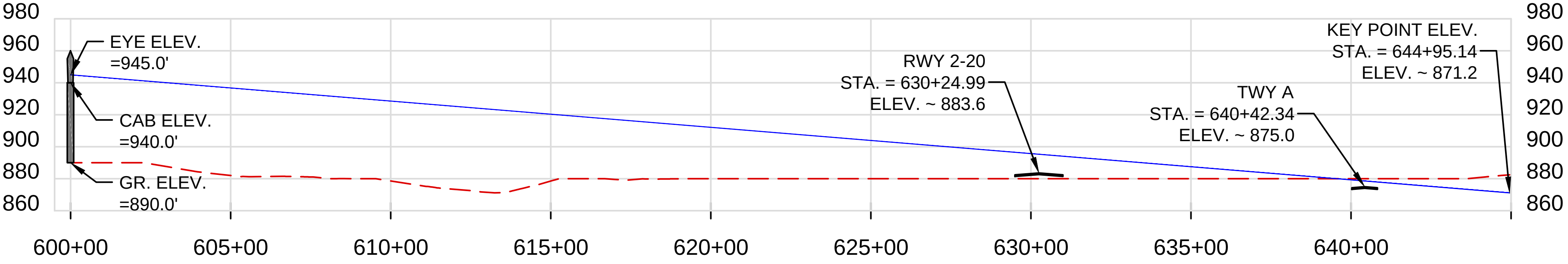
EXHIBIT
5.15B

Exhibit 5.15C Alternate 5 Line of Sight from ATCT

ALT 5 - NORTH APRON EDGE PROFILE



ALT 5 - SOUTH APRON EDGE PROFILE



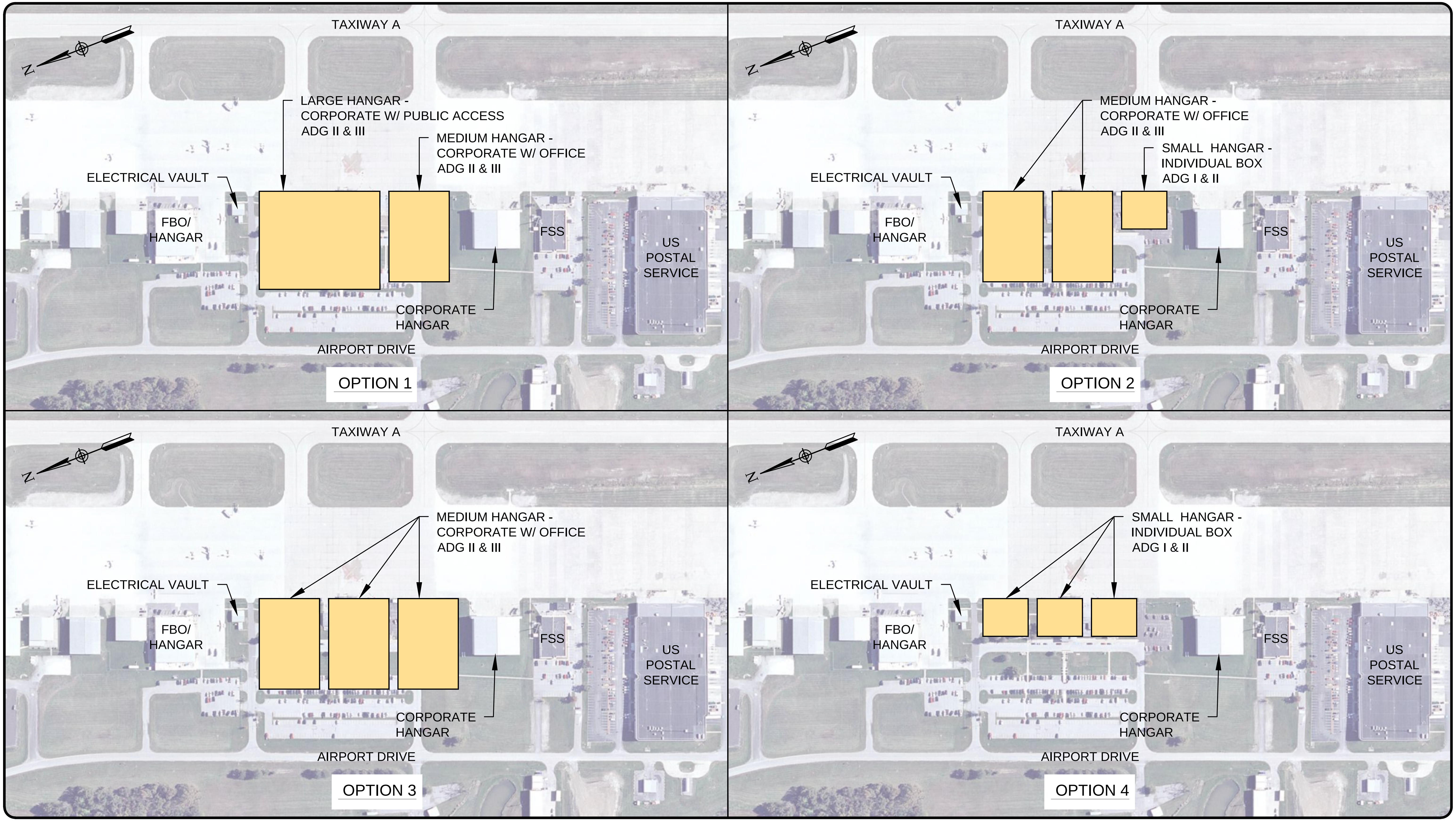
PROPOSED ATCT LOS - ALT 5

MOST DISTANT KEY POINT	NORTH APRON EDGE	SOUTH APRON EDGE
DISTANCE TO CAB FROM KEY POINT	3,629 Ft	4,495 Ft
FAA LOS ANGLE OF INCIDENCE	1.16	0.94
HEIGHT OBSERVER (H_O)	73.2	73.9
GROUND ELEVATION OF KEY POINT (P_E)	871.8	871.2
GROUND ELEVATION OF TOWER (T_E)	890.0	890.0
EYE HEIGHT ABOVE GROUND (H_C)	55	55
TOWER CAB FLOOR HEIGHT	50	50

Alternate 5 Line of Sight from ATCT

EXHIBIT
5.15C

Exhibit 5.16 Repurposed Original Terminal Site Hangar Layout Options



COLUMBIA
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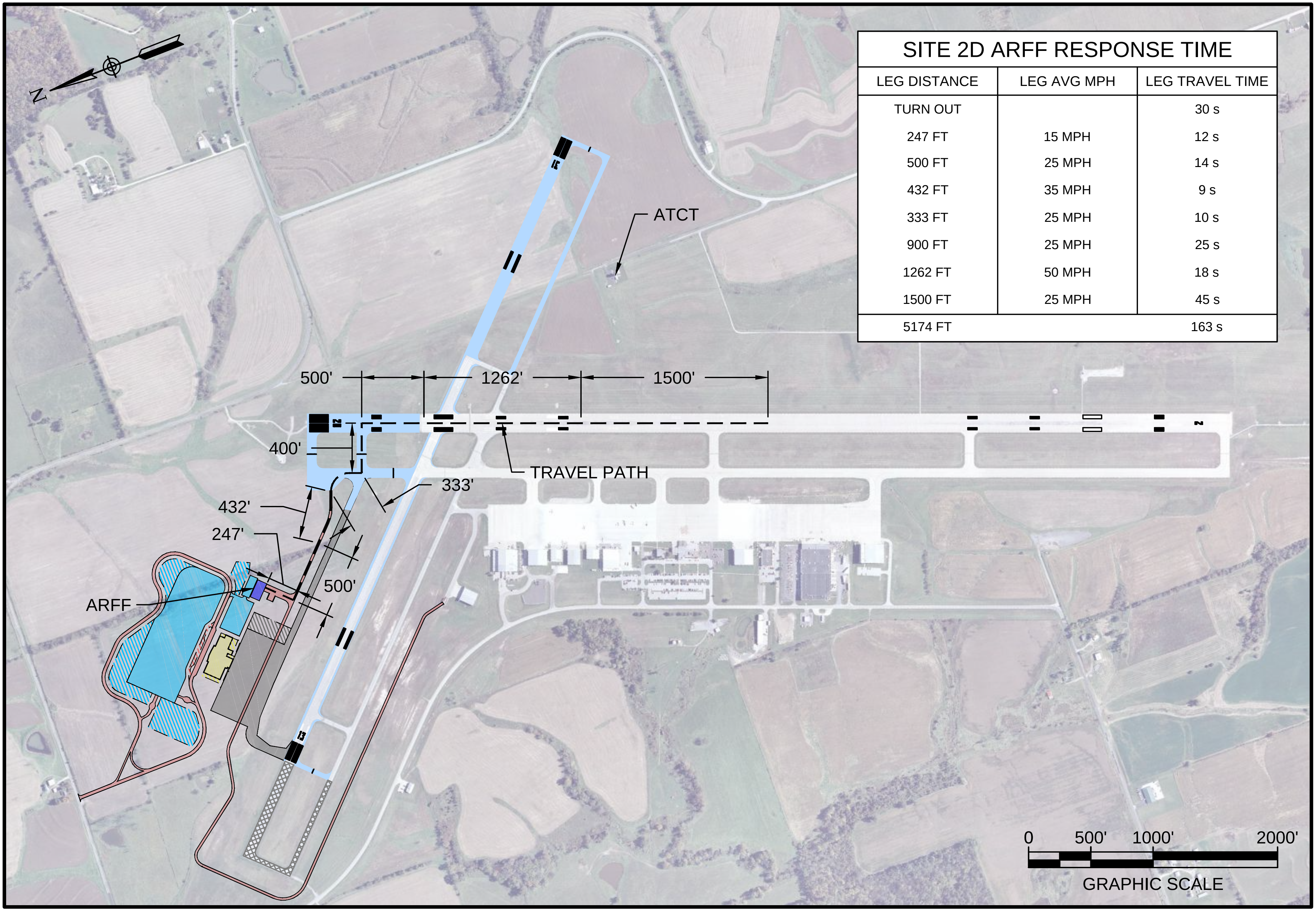
TERMINAL AREA MASTER PLAN

REPURPOSED ORIGINAL TERMINAL SITE
HANGAR LAYOUT OPTIONS

0 150' 300' 600'
GRAPHIC SCALE

EXHIBIT
5.16

Exhibit 5.17 Site 2D Aircraft Rescue and Fire Fighting Response Time



SITE 2D ARFF RESPONSE TIME

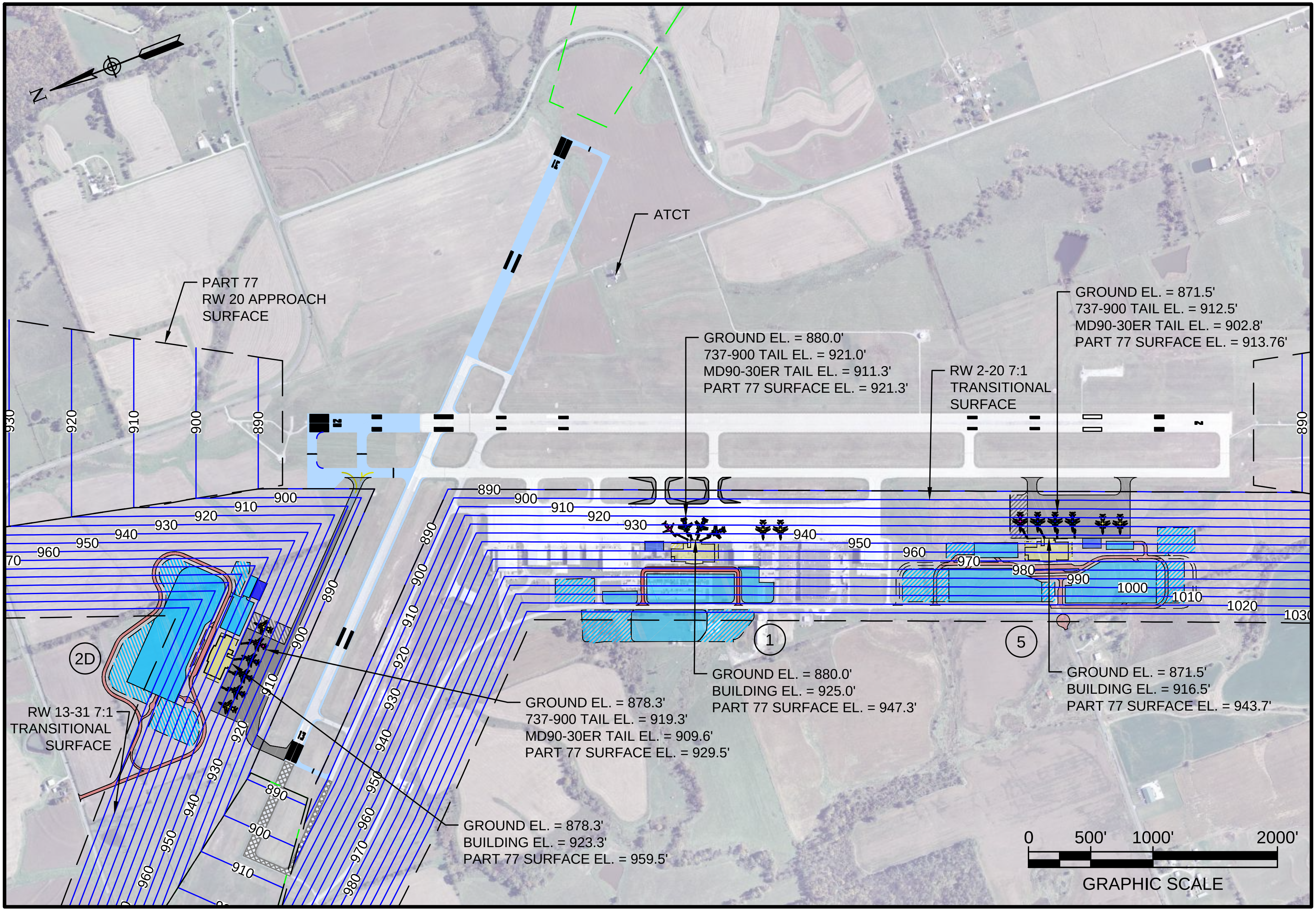
LEG DISTANCE	LEG AVG MPH	LEG TRAVEL TIME
TURN OUT		30 s
247 FT	15 MPH	12 s
500 FT	25 MPH	14 s
432 FT	35 MPH	9 s
333 FT	25 MPH	10 s
900 FT	25 MPH	25 s
1262 FT	50 MPH	18 s
1500 FT	25 MPH	45 s
5174 FT		163 s

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

SITE 2D AIRCRAFT RESCUE AND FIRE FIGHTING RESPONSE TIME

EXHIBIT
5.17

Exhibit 5.18 Part 77 Surfaces



COLUMBIA Regional Airport

COLUMBIA REGIONAL AIRPORT
COLUMBIA, MO
TERMINAL AREA MASTER PLAN

PART 77 SURFACES

EXHIBIT
5.18

6 ENVIRONMENTAL OVERVIEW

This chapter documents the Environmental Overview of the preferred alternative presented in Chapter 5. The Environmental Overview identifies the existing environmental conditions of the project area, as well as potential environmental impacts from the planned development. It provides federal, state, and local government officials and the general public with an understanding of the environmental resources and constraints within the project area. The information provided here as an overview to inform the planning process, however, this chapter does not represent the documentation required by the National Environmental Policy Act, as discussed further below.

6.1 Environmental Process in Aviation

Proposed actions or projects that require “Federal actions”, or that receive Federal funding must be assessed from an environmental standpoint in order to comply with the National Environmental Policy Act (NEPA) of 1969. The planned Airport development would require a Federal action, such as FAA approval of the Airport Layout Plan depicting the proposed development; and therefore would require compliance with the FAA environmental process. Federal regulations outline three levels of process and documentation in order to assess the proposed airport development: categorical exclusion (CatEx), environmental assessment (EA) and environmental impact statement (EIS):

- A Categorical Exclusion applies to those proposed projects that have been found as a category to have no potential for significant environmental impacts. For example, seal coating existing pavement is categorically excluded.
- An Environmental Assessment is prepared when a proposed project has the potential to significantly affect the environment. For example, terminal expansion or development of a new passenger terminal. If an environmental assessment finds that a proposed project will not result in significant impacts, a Finding of No Significant Impact would be issued by the FAA.
- An Environmental Impact Statement is required for major projects that are expected to have high potential for significant environmental impacts. An EIS involves in-depth examinations of the existing environment resources, environmental impacts from proposed action and environmental management and mitigation that would minimize assessed impacts. It also discloses information needed for the public to understand the proposed action and its environmental effects. Major airport actions at a commercial service airport within a metropolitan statistical area normally require an EIS.

The Council on Environmental Quality regulation 1501.2 states that, “Agencies shall integrate the National Environmental Policy Act (NEPA) process with other planning at the earliest possible time to ensure planning and decisions reflect environmental values, emphasize cooperative consultation among agencies before the environmental assessment is prepared; and identify significant environmental issues deserving of further study.” As such, this planning document includes both an environmental inventory as well as an overview of potential environmental impacts. Additionally, potential environmental impacts were considered during the development and evaluation of alternatives, and the preferred alternative was revised to avoid impacts.

This environmental overview is not a formal NEPA assessment but is a preliminary review of known environmental resources during the planning process to: 1.) avoid and minimize any potential impacts, and 2.) point out those areas that may be potentially affected by the planned development at the Airport and could require NEPA process.

6.2 2013 Environmental Assessment

As discussed previously in Chapter 1, an EA completed in July 2013 (2013 Runway EA) examined the environmental impacts of multiple airfield and surface transportation projects associated with the short-term improvements identified in the 2009 Master Plan.

Nineteen categories listed in Federal Aviation Administration Order 1050.1E Change 1 were analyzed and addressed in the EA:

1. Air Quality
2. Climate
3. Coastal Resources
4. Compatible Land Use
5. Construction Impacts
6. Department of Transportation Act: Sec 4(f)
7. Farmlands
8. Fish, Wildlife, and Plants
9. Floodplains
10. Hazardous Materials, Pollution Prevention, and Solid Waste
11. Historical, Architectural, Archeological, and Cultural Resources
12. Light Emissions and Visual Impacts
13. Natural Resources, Energy Supply, and Sustainable Design
14. Noise
15. Secondary (Induced) Impacts
16. Socioeconomic Impacts, Environmental Justice, and Children’s Environmental Health and Safety Risks
17. Water Quality
18. Wetlands
19. Wild and Scenic Rivers

Table 6.1 provides a summary of the impact results of the 2013 Runway EA by category.

Table 6.1 Summary of 2013 Runway Environmental Assessment

Impact Category	Impact Level	Description
Air Quality	Not Significant	Annual ops would not exceed 180,000. Minor increase in taxi times
Climate	None	NAAQS threshold not exceeded.
Coastal Resources	None	
Compatible Land Use	Not Significant	Property acquisition – 52 acres. Road relocations. No residence or business relocations.
Construction Impacts	Not Significant	Temporary impacts to air emissions, biotic communities, energy and natural resources, hazardous materials, noise, traffic, and water quality. BMPs must be used to minimize impacts.
Department of Transportation Act: Sec 4(f)	Not Significant	No direct impacts. No indirect impacts to Section 4(f) resources.
Farmlands	Not Significant	Complies with FPPA as long as Airport permits as much area as possible within acquisition area to continue to be farmed.
Fish, Wildlife, and Plants	Not Significant	No adverse effects on critical habitats or threatened or endangered species.
Floodplains	Not Significant	No direct impacts to 100-yr floodplain. Airport would comply with NPDES stormwater requirements. No adverse indirect impacts.
Hazardous Materials, Pollution Prevention, and Solid Waste	Not Significant	No known or suspected environmental contamination. No additional MSW generation. No increased bird strike potential.
Historical, Architectural, Archeological, and Cultural Resources	Not Significant	No recorded historic resources. No adverse effects on archaeological resources.
Light Emissions and Visual Impacts	Not Significant	No light-sensitive land uses within 1,500 feet. Intervening topography and vegetation would shield.
Natural Resources, Energy Supply, and Sustainable Design	Not Significant	Minor increased electrical demand. No substantial impact to water system. Minor increase in aviation fuel use; no significant change in fuel availability.

Impact Category	Impact Level	Description
Noise	Not Significant	Projected 65 DNL contour remains on Airport property. No national parks, wildlife refuges or historic properties nearby.
Secondary (Induced) Impacts	Not Significant	No construction or development in residential areas. No significant shifts in population movements or increased demand for public services. Temporary and minor induced impacts.
Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks	Not Significant	No residential or business acquisitions or relocations. No disruption of established communities. No impact to children's environmental health or safety.
Water Quality	Potential Impact	Potential impact to water quality standards during construction. BMPs must be utilized during construction to minimize impacts. NPDES permit must be acquired.
Wetlands	Minor	Three jurisdictional streams impacted by road relocations. Mitigation measures required during construction.
Wild and Scenic Rivers	Not Significant	Nearest applicable river is three miles from the Airport. No anticipated adverse direct or indirect impacts.

Source: Final Environmental Assessment, *Airside, Landside, and Surface Transportation Developments*, RS&H, July 2013.
Compiled by: WSP | Parsons Brinckerhoff.

The coverage area of the 2013 Runway EA encompasses all of the areas included in the preferred alternative for the terminal area. As a result, this environmental overview consists of a desktop review to update those categories and areas affected by the preferred alternative for the terminal development and their potential change in impacts.

6.3 Environmental Factors and Resources

This section presents outcomes from a preliminary environmental constraints review for the project area and surroundings. An in-depth NEPA assessment and further study would be required to adequately evaluate environmental impacts from the planned improvements at the Airport. However, *potential* environmental impacts and issues will be identified in this section; as well as relevant regulations and government agencies for each environmental factor. For easy of reference, conclusions are **bolded**.

6.3.1 Air Quality

The FAA requires analysis to quantify air emissions related to aircraft operations when projected annual operations levels at an airport would exceed 180,000 operations. Because projections through 2035 are 117,500 annual operations, as documented in Chapter 3, no air quality analysis is needed at this stage.

Additionally, the Airport is located in an “attainment” area of all Federal air quality standards and regulations and, therefore, is not subject to the requirements of a State Implementation Plan (SIP) or a General or Transportation Conformity Determination.

Since the level of projected aircraft operations is the same for the preferred alternative and the no build alternative, it is expected that the air emissions associated with aircraft, ground service equipment, and potentially on-Airport motor vehicles would not change significantly. The runway improvements associated with the preferred alternative would likely cause only a minor increase in aircraft taxi time, which could have an equally minor effect on the associated operational emissions. Therefore, it is anticipated that the **preferred alternative would not result in a significant air quality impact**.

6.3.2 Coastal Resources

There are no areas within the City of Columbia, Boone County, or the State of Missouri that have been designated as coastal zones. As a result, effects to this category **do not apply** to the Airport.

6.3.3 Compatible Land Use

In accordance with FAA Order 1050.1E, the compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of related noise impacts. The FAA requires airports and airport sponsors seek compatible uses for the land surrounding an airport through appropriate zoning and municipal planning efforts.

No acquisition of property is proposed for the preferred alternative, and as a result, resident or business relocation is not a component of the preferred alternative. No existing roadway relocations are proposed for the preferred alternative. Noise impacts associated with the proposed project are discussed in Section 6.2.13. Surrounding land uses not under airport control are agricultural. **No significant land use compatibility impacts are anticipated.**

6.3.4 Construction Impacts

On-site construction activities will be conducted in accordance with FAA Advisory Circular 150/5370-10, *Standards for Specifying Construction of Airports,* and FAA Advisory Circular 150/5370-10A, *Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion, and Siltation Control* and incorporate best management practices into project plans.

Construction impacts are commonly temporary in nature and cease once construction is complete. Typical impacts resulting from airport construction projects include: increased vehicular traffic on roadways, noise from construction equipment, noise and dust from delivery of material through local streets, air pollution from construction equipment exhaust and dust, and erosion that may have effects on surrounding water bodies.

Construction impacts cannot be avoided and the preferred alternative would require the contractor to minimize temporary impacts that could occur during construction. The provisions and specifications of FAA AC 150/5370-10F would be implemented to avoid and/or minimize adverse construction impacts. As applicable, other best management practices will be put into place before or during construction activities to minimize effects on environmental factors within and adjacent to Airport property. **No significant construction impacts are anticipated.**

6.3.5 Department of Transportation Act, Section 4(f)

Section 4(f) of the Department of Transportation Act of 1966 [Title 49, USC Section 1653 (f); amended and recodified in 49 USC Section 303] provides that the Secretary of Transportation will not approve any program or project that requires the use of publicly owned land from a park, recreation area, or wildlife and waterfowl refuge of national, State or local significance or land from an historic site of national, State or local significance.

Section 6(f) of the Land and Water Conservation Fund Act (L&WCFA) [16 USC, Section 4601 et. seq.); 36 Code of Federal Regulations (CFR) Part 59] prohibits the taking of lands purchased with land and water conservation funds. The Secretary of the Department of Transportation has jurisdiction over Section 4(f) lands. The Department of the Interior and National Park Service has jurisdiction over Section 6(f).

The nearest Section 4(f) property is the Mark Twain National Forest, located 1 mile east of the Airport. There are no Section 6(f) resources within the Airport vicinity. The Proposed Action DNL 65+ dBa noise contours analyzed as part of the 2013 EA occurred entirely on Airport property. No land acquisitions are proposed for the implementation of the preferred alternative. Therefore, the planned improvements are **not expected to impact nearby Section 4(f) resources**.

6.3.6 Farmlands

The Farmland Protection Policy Act (FPPA) regulates federal actions with the potential to convert farmlands to non-agricultural uses. The FPPA is intended to minimize the unnecessary and irreversible conversion of farmland to nonagricultural uses.

As discussed in Chapter 5, a preliminary site assessment was conducted to investigate for wetlands and other waterbodies in the area of the preferred alternative. The same preliminary assessment also included a farmland assessment to determine the effects of the proposed development on prime or unique farmland or farmland of state or local importance. The farmland assessment consisted of a review of the Alternative 2 layout with the U.S. Department of Agriculture National Resource Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) Soil Map, submission of Farmland Conversion Impact Rating (form AD-1006), and consultation with the Area Resource Soil Scientist with the NRCS. Site 2 scored below the threshold of 160 in the Farmland Conversion Impact Rating which would trigger an alternative site analysis. The proposed improvements associated with the refined preferred alternative presented in Section 5.5 would require a revised Farmland Conversion Impact Rating evaluation as part of the future environmental documentation, but is **not anticipated to result in significant impacts to farmlands**.

6.3.7 Fish, Wildlife, and Plants

As part of the 2013 EA, a survey of Sensitive Species and Evaluation of Habitat Quality was conducted to describe the vegetative habitat in the Airport Study Area, which includes the area associated with the preferred alternative. The following sensitive species were identified in the EA having the potential to occur in Boone County:

- Running Buffalo Clover (*Trifolium stoloniferum*)
- Pallid Sturgeon (*Scaphirhynchus albus*)
- Topeka Shiner (*Notropis topeka*)
- Indiana Bat (*Myotis sodalis*)
- Gray Bat (*Myotis grisescens*)
- Greater Prairie Chicken (*Tympanuchus cupido*)

The Running Buffalo Clover, Topeka Shiner, Gray Bat, and Indiana Bat were not detected during survey activities for the 2013 EA. The restrictive habitat requirements of the Running Buffalo Clover, Gray Bat, and Topeka Shiner do not occur in the EA's Airport Study Area or immediately adjacent to the Airport. Habitat requirements for the Indiana Bat, Pallid Sturgeon or Greater Prairie Chicken were also not found on, or near the Airport vicinity. Lastly, as part of the 2013 EA, the USFWS determined that no federally listed species, candidate species, or designated critical habitat occur within the Airport vicinity. A revised habitat analysis should be conducted for the future environmental documentation for the proposed development as habitats are fluid and can change, however based on currently available information, the preferred alternative development is **not anticipated to result in significant impacts** to fish, wildlife, or plants.

6.3.8 Floodplains

Executive Order 11988 directs Federal agencies such as the FAA to "take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains". Department of Transportation (DOT) Order 5650.2, Floodplain Management and Protection, contains DOT's policies and procedures for implementing the Executive Order. The Executive Order and the DOT order establish a policy to avoid taking action within a 100-year floodplain, where practicable. The Federal Emergency Management Agency (FEMA) published Flood Insurance Rate Maps (FIRM) in support of the National Flood Insurance Program for the U.S.

The FIRM for the area including the Airport indicates there are no floodplains on Airport property. The preferred alternative would not directly impact a 100-year floodplain. Additionally, the Airport is subject to the conditions of its National Pollutant Discharge Elimination System (NPDES) Permit, regulating stormwater discharges from the Airport. By continuing to comply with NPDES stormwater requirements and establishing parameters during the design phase, the potential direct and indirect floodplain impacts of the preferred alternative are **not considered to be significant**.

6.3.9 Hazardous Materials, Pollution Prevention, and Solid Waste

The 2013 EA identifies six regulated facilities within the Airport Study Area:

- One underground storage tank (UST) registered with the Missouri Department of Natural Resources (MDNR).
- Five facilities that report to the US Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA).

There are no sites listed or delisted former sites on the National Priority List (NPL) in the Airport vicinity. The UST is owned and operated by Central Missouri Aviation with a listed address of 11200 Airport Road. The five RCRA facilities were identified as follows:

- Airborne Express, Handler ID: MOD985819168
- Central Missouri Aviation, Handler ID: MOD985772060
- McDonnell Aircraft Co, Handler ID: MOD981715451
- Ozark Management Inc., Handler ID: MOP000503532
- United States Postal Service, Handler ID: MOD985808633

The preferred alternative is located in areas of the Airport that are not suspected to contain environmental contamination, and no substantial impacts due to hazardous materials are anticipated.

The preferred alternative would not increase the number of operations and enplanements over a No Action scenario. Therefore, significant additional municipal solid waste generation would **not be anticipated** for the preferred alternative.

6.3.10 Historical, Architectural, Archeological, and Cultural Resources

The National Historic Preservation Act (NHPA), as amended, provides for the preservation of cultural resources eligible for inclusion in the National Register for Historic Places (NRHP). Section 106 of the NHPA directs heads of Federal or independent agencies that have direct or indirect jurisdiction over a Federal or federally assisted undertaking, to “take into account the effect on any district, site, building, structure, or object that is included in or eligible for the inclusion in the National Register”.

As part of the 2013 EA, no historic or architectural resources were identified within the Area of Potential Effect (APE) for the Proposed Action. The closest NRHP site is located approximately 6.5 miles northwest of the Airport. A Phase I Cultural Resource Survey was completed as part of the 2013 EA that identified one previously undocumented archaeological site consisting of low density early 20th century domestic and agricultural materials, associated with early farmstead activity. This site is located off the east end of Runway 13-31, and not affected by the preferred alternative for this project.

The APE analyzed for the 2013 EA includes portions of the area covered by the preferred alternative, however does not include coverage of the entire site[13]. While there are no NHRP or Missouri Department of Natural Resources historic resources within the project area, an expanded investigation of cultural resources would be needed to cover the additional area within the preferred alternative project area during the NEPA documentation phase for this development. Based on available information from the 2013 EA, it is currently **not anticipated that the preferred alternative would result in significant impacts in this category**.

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[13] Figure 4-4; Final Environmental Assessment, Airside, Landside, and Surface Transportation Developments, Columbia Regional Airport (COU), RS&H, July 2013.

6.3.11 Light Emissions and Visual Impacts

FAA Order 1050.1E states the project sponsor shall consider the extent that lighting associated with an airport action will create an annoyance or interfere with normal activities among people in the vicinity of the installation. New lighting would be part of the proposed terminal and aircraft apron project. As applicable, best management practices will be implemented in order to minimize effects on areas adjacent to Airport property.

Visual impacts of the preferred alternative will be assessed in the NEPA documentation. Visual amenity will need to be analyzed before and during the design of buildings and other structures. Further federal, state or local guidelines may apply.

6.3.12 Natural Resources and Energy Supply

The FAA Order 1050.1E states that a significant environmental impact on energy and natural resource consumption occurs when airport actions result in demand exceeding supplies. This is in relation to the use of energy by new structures and facilities; as well as changes in ground vehicles and/or aircraft.

The preferred alternative would result in minor long-term increases in electricity demand, as a result of the increased size of the terminal building and larger parking areas that may contain lighting. The increase is expected to be small due to the use of high-efficiency lighting technology, such as LEDs. Potable water consumption may also increase due to the increased terminal footprint, however sustainable features incorporated during the design phase of the project will minimize any consumption increases.

The relocation of the terminal apron would result changes in commercial aircraft taxi distances. From the relocated terminal building, aircraft would be required to travel approximately 3,760 feet farther to depart from Runway 2, and approximately 1,400 feet less to depart from the extended Runway 20. During calm wind conditions and low activity conditions however, ATC could permit aircraft at the relocated terminal to choose which runway to depart from. For example, commercial aircraft landing on Runway 2 may depart on Runway 20 if wind conditions and ATC permit it, reducing overall taxi distance compared to departing on Runway 2.

Additional taxi distance associated with the preferred alternative would result in additional fuel consumption. However, the additional fuel consumption is not anticipated to result in demands for natural resources that would exceed available or future supply capacity. Passenger vehicle travel distances would decrease with the preferred alternative. Travel distance from the Route H/Airport Drive intersection to the proposed terminal building would be approximately 35 percent shorter than the existing travel distance to the current passenger terminal. Therefore, **significant additional consumption of natural resources is not anticipated** for the preferred alternative.

6.3.13 Noise

Guidance in FAA Orders 5050.4B and 1050.1E provide the methodology for preparing aircraft noise exposure maps. The FAA requires analyses of subsonic aircraft noise exposure and compatible land uses around civilian airports be accomplished using a computer-based program—Integrated Noise Model.

The noise model incorporates the number of annual average daily daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) flight events; as well as the flight paths and profiles, and noise and performance information. Model outputs provide the overall daily sound level at many points on the ground around an airport. From a plotted grid of points, contours of the forecasted daily sound levels are plotted for overlay onto land use maps. Nearby residences, schools, and other noise-sensitive land uses are considered non-compatible with day-night average sound level of 65dBA or greater.

The 2013 EA concluded that the proposed runway project would not cause any significant noise-related impacts due to the project-related 65 DNL contour remaining within Airport property. The noise contours developed for the 2013 EA are based on the forecast developed for the 2009 Airport Master Plan Update.

As discussed in Chapter 3, total annual operations at COU have decreased from 29,755 in 2007 (the base year of the 2009 Airport Master Plan Update forecast) to 20,938 in 2014. However, annual commercial service operations have increased from 3,076 operations to 3,453 operations over the same period. The 2009 Airport Master Plan forecast assumed overall annual operations would reach 37,100 by 2027, with commercial service operations totaling 3,532. The forecast for the Terminal Area Master Plan assumes overall annual operations will reach 22,900 by 2030, with commercial service operations totaling 4,364. While total annual aircraft operations are reduced between the two forecasts, commercial service aircraft operations are higher.

Due to the overall reduction of total operations at the Airport since the 2009 Airport Master Plan forecast was developed and the changes to the commercial service aircraft fleet serving the Airport **a revised noise analysis may be required for the future environmental documentation for the proposed development**.

6.3.14 Secondary (Induced) Impacts

Major development proposals often involve the potential for induced or secondary impacts on surrounding communities. Induced impacts include shifts in patterns of population growth and movement; public service demands; and changes in business and economic activity to the extent influenced by airport development.

Development of the preferred alternative is not anticipated to involve any construction or development activity in residential areas, resulting in no significant shifts in population movements or increases in the demand for public services. **Short-term increases in employment, output, and income benefits would be associated with the construction of the improvements and would be temporary in nature.**

6.3.15 Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks

FAA Order 1050.1E describes the socioeconomic impacts associated with relocation or other community disruption, transportation, planned development, and employment. This evaluation also includes effects on environmental justice and children's health and safety.

Much of the land surrounding the Airport is undeveloped. No extensive resident or business displacements are anticipated and no road closures are proposed as a result of the preferred alternative.

The Council on Environmental Quality's environmental justice guidance under NEPA identifies that a minority population should be identified when the minority population exceeds 50%; or when the minority population is meaning fully greater than the minority population of the general population. Based on the 2013 EA, the areas analyzed, which include the area affected by the terminal preferred alternative, **no significant socioeconomic impacts, disproportionate impacts to low-income and minority populations, or effects on children's environmental health and safety are anticipated**.

6.3.16 Water Quality

The U.S. EPA, the MDNR, and the U.S. Geological Survey (USGS) regulate and monitor the water quality in the state of Missouri. The preferred alternative would create new impervious surfaces that result in increased stormwater runoff. Prior to construction, prior permitting and compliance with state and local environmental agencies should be sought to minimize potential water quality impacts.

The Airport is subject to the conditions of its NPDES Permit, regulating stormwater discharges from the Airport. By continuing to comply with NPDES stormwater requirements and establishing parameters during the design phase**, the potential direct and indirect impacts of the preferred alternative are not considered to be significant**.

The preferred alternative is not expected to alter or introduced new operational activities compared to a No Action alternative. As a result, impacts to groundwater resources and water quality are not anticipated. Best Management Practices (BMPs) and SPCC plans will be designed for the preferred alternative to prevent or minimize the potential release of contaminants into the groundwater.

6.3.17 Wetlands

Agencies that regulate impacts on water resources within Missouri include the U.S. Army Corps of Engineers (USACE), the USEPA, and the USFWS. The USACE is the primary regulatory authority enforcing Section 404 requirements for wetlands and "Waters of the U.S." Wetlands and the jurisdictional "Waters of the U.S." are protected under Sections 401 and 404 of the CWA, EO 11990, *Protection of Wetlands*. The State of Missouri regulation of wetlands rests solely with Section 401 state water quality certifications and the State's general water quality standards.

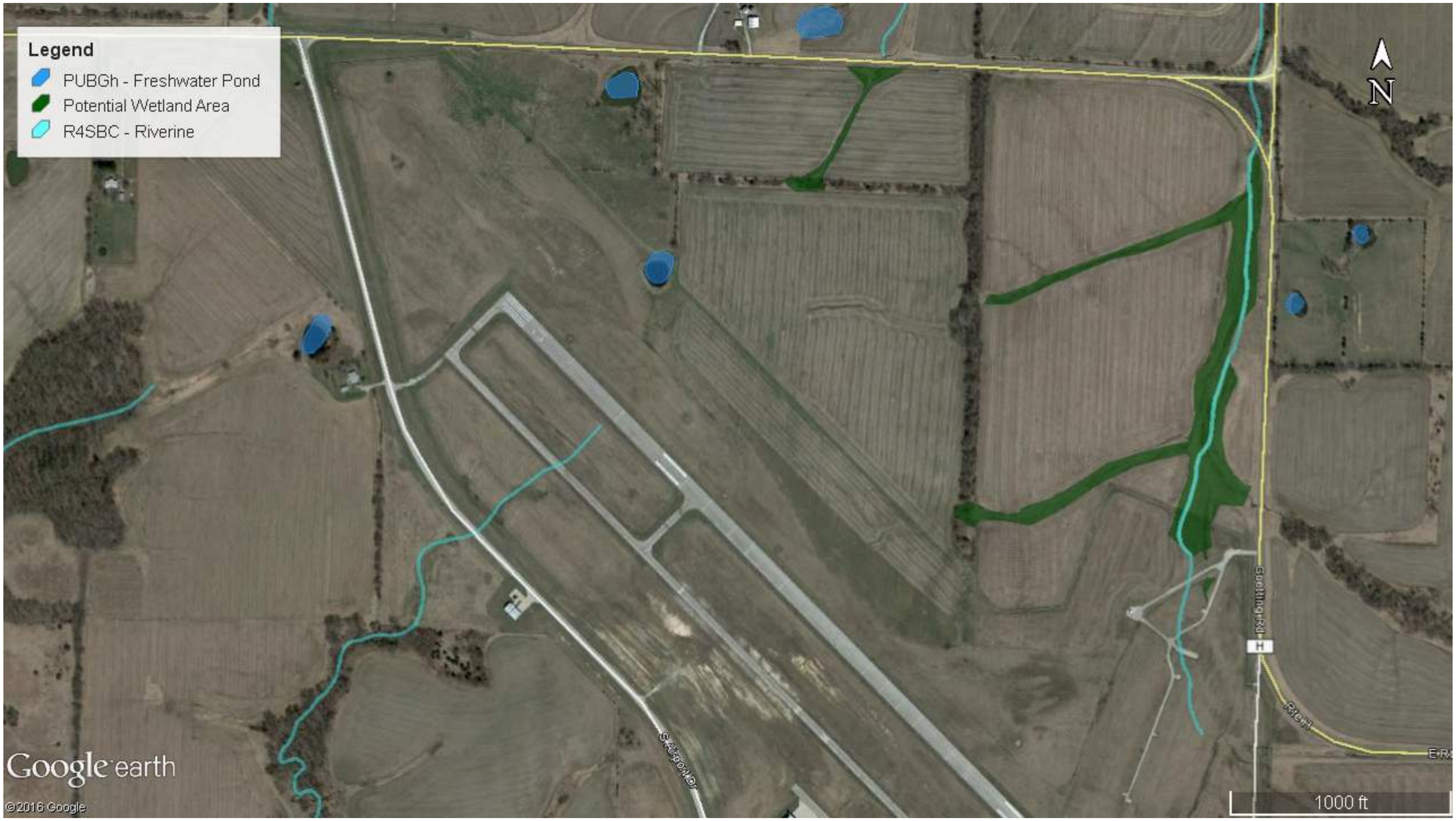
The USFWS National Wetlands Inventory Mapping identifies two riverines near the site as a R4SBC wetland, which means it is a riverine and intermittent stream that is seasonally flooded.

One riverine is located across Route H north of the preferred site. The second is located along the eastern edge of airport property parallel to Route H after the 90° bend south of Rangeline Road. Two freshwater ponds are also located in the vicinity of the preferred alternative on the western portion of the northwest greenfield site. As discussed in Chapter 5, a preliminary site assessment was conducted to investigate for wetlands and other waterbodies. As shown on **Exhibit 6.1**, two potential wetland areas were identified in the area under consideration for the preferred alternative. The revised orientation of the alternative as presented in Section 5.5 avoids the areas identified during the preliminary assessment. Only the US Army Corps of Engineers can make the final determination on the jurisdictional status of potential waterbodies, and on the need for permit processing and compensatory mitigation. If these areas are identified during an official wetland delineation of this area, **no impacts to wetlands or "Waters of the U.S." would be expected from the planned Airport development**.

6.3.18 Wild and Scenic Rivers

The U.S. Department of the Interior has jurisdiction over rivers on the National Inventory. The Wild and Scenic Rivers Act, as amended, protects rivers listed on the National Inventory of Wild and Scenic Rivers. Based on the information in the 2013 Runway EA, there are no wild or scenic rivers located within the Airport vicinity, resulting in **no impacts on these natural features**.

Exhibit 6.1 Wetland Areas



Source: National Wetland Inventory Map; Terracon (Wetland Areas); Google Earth (Aerial)

7 TAMP CIP IMPLEMENTATION / FINANCIAL FEASIBILITY

This chapter analyzes the financial feasibility of the phased Terminal Area Master Plan (TAMP) Capital Improvement Program (CIP), together with other planned capital projects at the Columbia Regional Airport (COU or Airport), which includes the Airport Capital Improvement Program (ACIP). Specifically, this chapter examines the financial structure of COU and proposes a financial plan that identifies potential sources of funding for the TAMP CIP. After the initial phase of the TAMP CIP, projects will be undertaken when demand warrants, rather than in accordance with a projected schedule developed in advance. Further, the actual funding and financing of capital expenditures (both the TAMP CIP and the ACIP) will be a function of the City of Columbia, Missouri’s (City’s) and Airport's financial circumstances at the time of project implementation. For example, a project would not be undertaken if the capital needs for a project stand to negatively impact the Airport's financial position, or if passenger facility charges (PFCs) and/or Federal grants available at the time of implementation of a particular project are insufficient to meet project costs.

The assumptions and analyses prepared for the TAMP CIP must be reviewed in the context of their primary purpose, which is to examine whether there is a reasonable expectation that the recommended capital improvements will be financially feasible and implementable. Based upon these analyses, which include certain timing, funding, and financing assumptions, the recommended TAMP CIP is projected to be financially feasible within the financial structure of COU as an enterprise fund of the City.

COU contributes to the economic strength of the City and the State of Missouri. It is estimated that employment and activities at COU employ nearly 1,000 workers and contribute approximately $90 million to the local and state economy annually. According to the *2012 Missouri Statewide Airports Economic Impact Study*, COU is fourth in the State of Missouri for its economic contributions, following commercial service airports in Kansas City, St. Louis, and Springfield, respectively.

To present the results of these analyses, this chapter is organized as follows:

- Airport Financial Structure
- TAMP CIP Phasing and Cost
- TAMP CIP and ACIP Funding
- Debt Service
- Operating Expenses
- Operating Revenues
- Cash Flow
- Scenario Analysis
- Findings

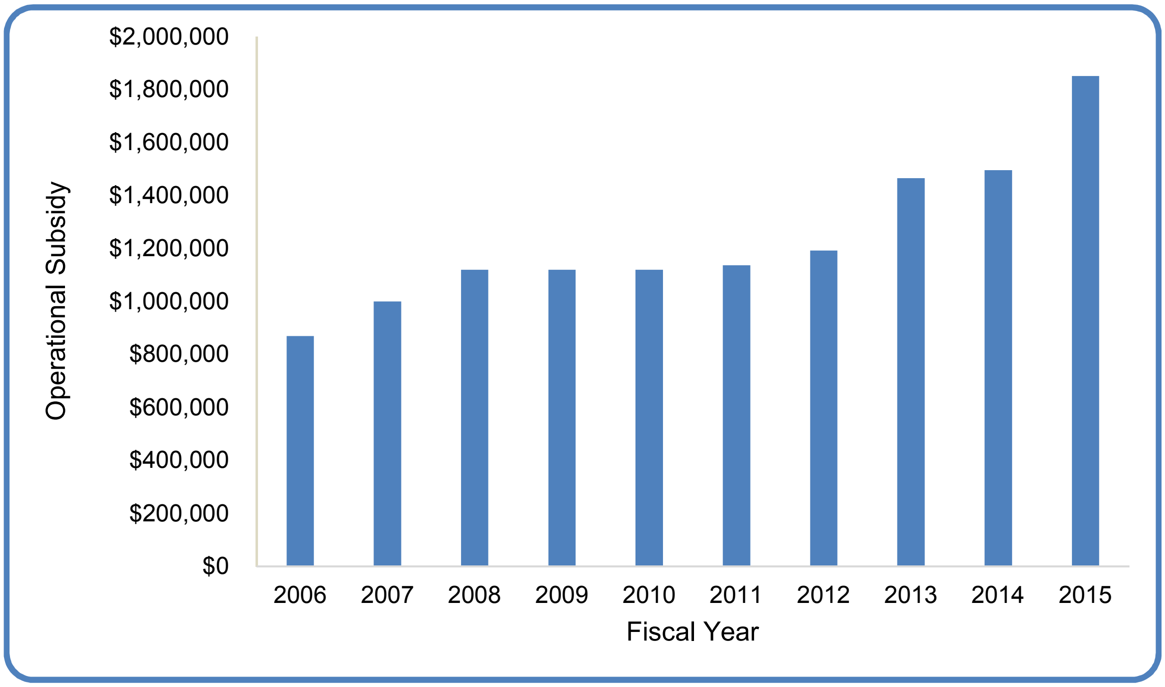
7.1 Airport Financial Structure

The Airport is owned and operated by the City. The Airport is an enterprise fund (Airport Fund) of the City. According to the Fiscal Year[14] (FY) 2015 Comprehensive Annual Financial Report (CAFR), the City's enterprise funds are used to account for operations that are financed and operated in a manner similar to private business enterprises; where the intent of the government's council is that the costs of providing goods or services to the general public on a continuing basis be financed or recovered primarily through user charges; and/or where the government's council has decided that periodic determination of net income is appropriate for accountability purposes.

The City records its financial data on an accrual basis in accordance with Generally Accepted Accounting Principles (GAAP). The City of Columbia has historically contributed both an operational and/or a capital subsidy to the Airport Fund on an annual basis to fund operations costs and capital investments that are not covered by revenues generated at the Airport. Information related to these subsidies is provided below.

- Operational Subsidy: The operational subsidy has ranged from approximately $800,000 in FY 2006 to approximately $1.8 million in FY 2015. **Exhibit 7.1** presents the historical total operating transfer provided to the Airport Fund. As shown, the operating subsidy to the Airport Fund has gradually increased over time.

Exhibit 7.1 Historical Operational Subsidy



Source: City of Columbia. Compiled by WSP | Parsons Brinckerhoff, 2016.

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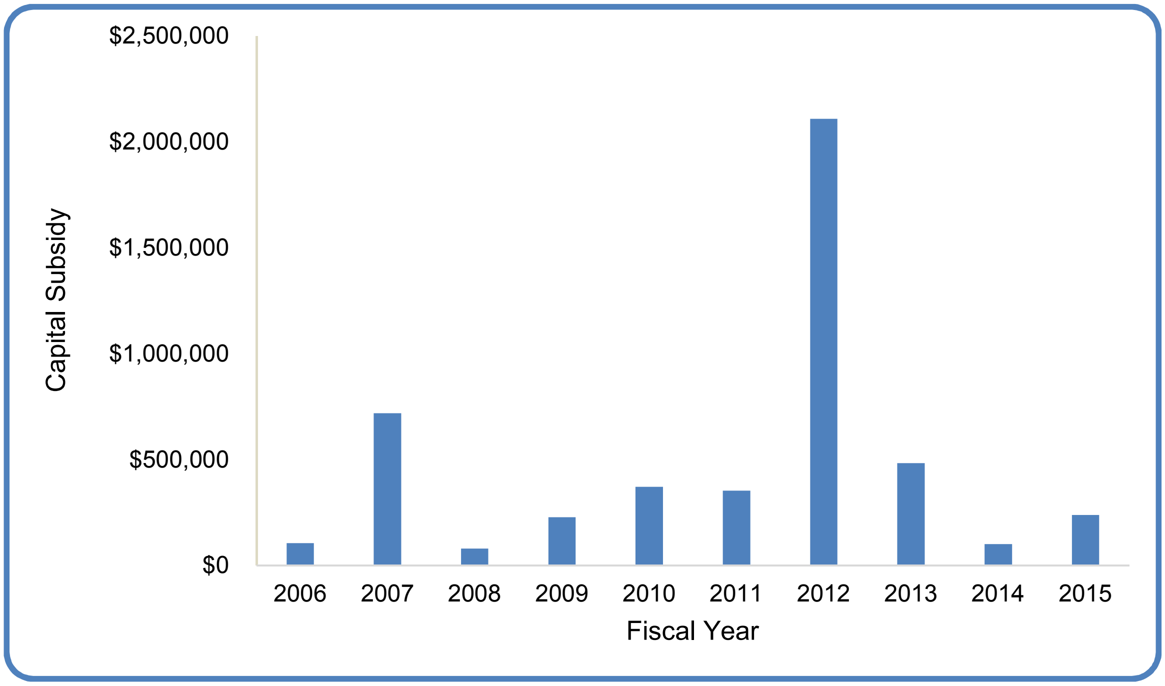
[14] The City's fiscal year begins October 1st and ends September 30th each year. For example FY 2015 began October 1, 2014 and ended September 30, 2015.

- Capital Subsidy: This subsidy has ranged from approximately $90,000 in FY 2008 to approximately $2.1 million in FY 2012. This subsidy has varied greatly and is directly related to COU's annual capital need, as well as the amount of FAA Airport Improvement Program (AIP) grants awarded and passenger facility charges (PFCs) generated each year. **Exhibit 7.2** presents the historical capital subsidy that has been provided by to the Airport Fund.

Exhibit 7.2 Historical Capital Subsidy



Source: City of Columbia. Compiled by WSP | Parsons Brinckerhoff, 2016.

In addition, the City historically received Airport Improvement Program (AIP) grants from the FAA to fund its capital costs and it is likely that COU will continue to receive grants from Federal or other resources for its capital program. More details regarding the AIP are discussed in a later section of this chapter.

To support the capital and operating subsidy provided to the Airport Fund there are several dedicated sales tax funds from which the subsidy can be contributed. Information on these funds was obtained from the City's Ten Year Financial Trend Manual (FY 2006 – FY 2015). These funds are described below.

- Transportation Sales Tax Fund (TST Fund): There is a non-expiring 0.5 percent sales tax levied in the City that contributes to the services provided including, road and sidewalk repair, the bus system, the Airport, parks, police, fire and nearly everything else with the exception of City utilities.
- Public Improvement Fund (PIF): This is a special revenue fund that accounts for 4.16 percent of the City's 1 percent general sales tax and development fees collected on new construction within the city. Sales tax receipts are deposited and accumulated in the PIF and transferred to the City's Capital Projects Fund, which has also been used to fund the local share of airport capital improvements.

- Hotel Tax Fund: In July 2016 City voters approved a dedicated 1 percent addition to the existing hotel and motel lodging tax to fund the implementation of the TAMP CIP, which is expected to fund $10 million in capital funds for the program.

There have been concerns in recent years related to a reduction in annual deposits from sales taxes going into the funds described above. As long as the Federal government continues its subsidy for online retailers, the City will continue to have reduced resources that fund both the TST Fund and the PIF.

7.2 TAMP CIP Phasing and Cost

The phasing plan and cost estimates, based on a planning level of detail, were prepared to illustrate the timing and relative magnitude of the TAMP CIP expenditures. It is anticipated that the TAMP CIP will be implemented in two phases: Phase 1 (2017 through 2022) and Phase 2 (2031 through 2033).

Approximately $50.4 million in TAMP CIP projects are projected at COU through FY 2033. **Table 7.1** lists the individual capital improvement projects that are recommended as part of the TAMP and includes inflation year of expenditure and including allowances for general conditions, construction management, and contingencies.

7.3 TAMP CIP and ACIP Funding

Section 7.2 of this chapter summarized the staged future TAMP CIP identified herein. These future capital expenditures were then categorized by project, according to each project's potential funding sources, with the airport-responsible portion of the projects (i.e., versus tenant funded projects) being the primary focus of the financial feasibility analyses. In addition to the TAMP CIP, the Airport Capital Improvement Program (ACIP) was also included in this financial analysis to provide a full financial feasibility of all airport operations and investment needs for the years projected in this analysis.

Table 7.2 contains TAMP CIP, as presented above, as well as the projected funding plan. **Exhibit 7.3** presents the distribution of funding by phase for the TAMP. A description of estimated funding sources for these projects is presented in greater detail in the following paragraphs.

Table 7.1 TAMP CIP Phasing and Cost

Project	2017$ Base Cost	Escalation	Other Allowances	Total Cost
Phase 1 (2017-2022)				
Design Phase 1	$5,220,829	$0	$0	$5,220,829
Aircraft Parking Ramp and Access Taxiway	$4,320,000	$382,509	$1,250,913	$5,953,422
Passenger Terminal Complex	$14,375,572	$911,020	$3,728,668	$19,015,260
Terminal Access Roadways & Curb front	$1,677,937	$178,812	$436,524	$2,293,273
Terminal Public Parking Lot	$2,179,512	$232,264	$567,011	$2,978,787
Rental Car Ready/Return Lot	$340,051	$36,238	$88,466	$464,755
Site Preparation Phase 1	$4,465,000	$235,746	$1,128,249	$5,828,995
Phase 1 Total	$32,578,901	$1,976,589	$7,199,830	$41,755,320
Phase 2 (2031-2033)				
Design Phase 2	$1,039,361	$0	$0	$1,039,361
Public Parking Lot Expansion	$370,214	$125,255	$96,477	$591,946
Rental Car Ready/Return Lot Expansion	$105,786	$35,791	$27,568	$169,144
Terminal Expansion	$2,767,310	$925,861	$713,144	$4,406,314
Apron Expansion	$505,000	$170,857	$131,602	$807,459
Route H Improvements	$475,000	$160,707	$123,784	$759,491
Site Preparation Phase 2	$543,000	$183,713	$141,505	$868,219
Phase 2 Total	$5,805,671	$1,602,183	$1,234,081	$8,641,935
TOTAL	***$38,384,572***	***$3,578,771***	***$8,433,912***	***$50,397,255***

Source: WSP | Parsons Brinckerhoff, 2017.

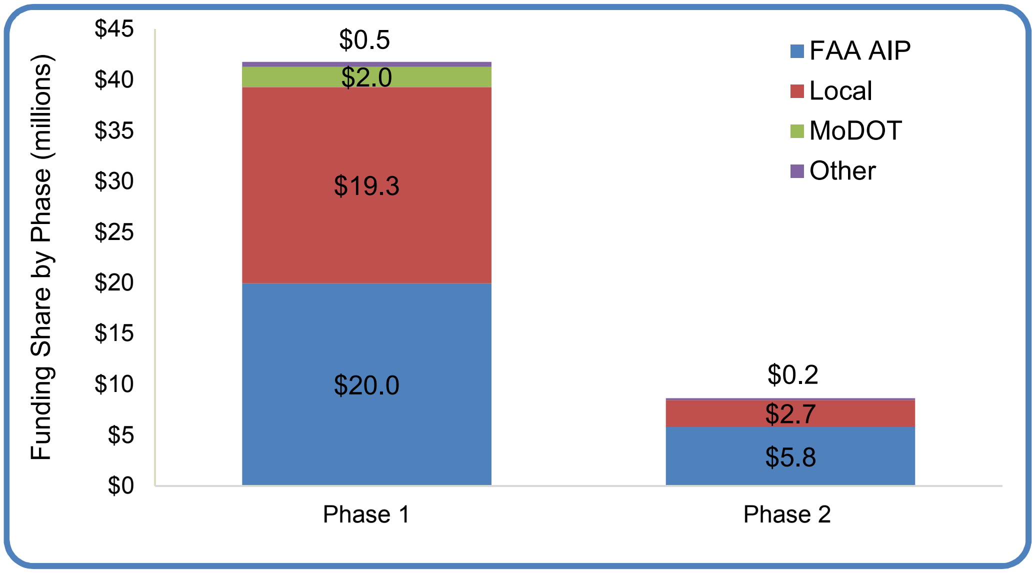
Table 7.2 TAMP CIP Funding Plan

Project	Total Cost	FAA AIP	MODOT	PFC	Other	Local
Phase 1 (2017-2022)						
Design Phase 1 (Note 1 below)	$5,220,829	$1,305,207	$2,000,000	$0	$0	$1,915,622
Aircraft Parking Ramp and Access Taxiway	$5,953,422	$5,358,079	$0	$0	$0	$595,342
Passenger Terminal Complex	$19,015,260	$8,309,669	$0	$0	$0	$10,705,591
Terminal Access Roadways & Curb front	$2,293,273	$2,063,946	$0	$0	$0	$229,327
Terminal Public Parking Lot	$2,978,787	$0	$0	$0	$0	$2,978,787
Rental Car Ready/Return Lot	$464,755	$0	$0	$0	$464,755	$0
Site Preparation Phase 1	$5,828,995	$2,914,497	$0	$0	$0	$2,914,497
Phase 1 Total	$41,755,320	$19,951,399	$2,000,000	$0	$464,755	$19,339,167
Phase 2 (2031-2033)						
Design Phase 2	$1,039,361	$675,585	$0	$0	$0	$363,776
Public Parking Lot Expansion	$591,946	$0	$0	$0	$0	$591,946
Rental Car Ready/Return Lot Expansion	$169,144	$0	$0	$0	$169,144	$0
Terminal Expansion	$4,406,314	$3,965,683	$0	$0	$0	$440,631
Apron Expansion	$807,459	$726,713	$0	$0	$0	$80,746
Route H Improvements	$759,491	$0	$0	$0	$0	$759,491
Site Preparation Phase 2	$868,219	$434,109	$0	$0	$0	$434,109
Phase 2 Total	$8,641,935	$5,802,090	$0	$0	$169,144	$2,670,701
TOTAL	*$50,397,255*	*$25,753,489*	*$2,000,000*	*$0*	*$633,898*	*$22,009,868*

Source: WSP | Parsons Brinckerhoff, 2017.

Note 1: This line item includes allowances for further planning and environmental studies, including the anticipated environmental assessment and benefit cost analysis required as part of receiving the $20M in discretionary funding for the Terminal project.

Exhibit 7.3 TAMP CIP Funding Distribution



Source: WSP | Parsons Brinckerhoff, 2017.

In addition to the TAMP CIP, there are approximately $32.9 million in ACIP projects at COU that are anticipated to be funded by Federal AIP Grants and PFCs, to the extent available, during the projection period, these projects and funding plans are presented in **Table 7.3**. Subsequent to the years presented in the table below, it is assumed there will be approximately $1.9 million in annual ACIP expenditures for the duration of the projection period.

7.3.1 Federal Grants

Originally authorized by the Airport and Airway Improvement Act of 1982, the AIP is funded through the Airport and Airway Trust Fund (enacted by legislation in 1970), which receives 100 percent of its funding from aviation-generated user fees including passenger and facility fees, as well as cargo and fuel taxes. The AIP provides Federal entitlement and discretionary funding grants to be used for AIP eligible projects at public use airports that enhance airport safety, capacity, security, and environmental concerns. Federal grants-in-aid classified as entitlement grants are apportioned annually to airports based upon the amount of activity at an airport. Passenger entitlements grants are distributed based on the number of passengers and cargo entitlement grants are distributed based upon an airport's share of the total amount of landed weight of all cargo aircraft at qualifying airports. Discretionary grants are provided at the discretion of the FAA based on its priorities, which in recent years has been aimed at improving airport safety.

Table 7.3 ACIP Projects and Funding Plan

Project	Total Cost	Federal	State	Local
Five - Year Capital Improvement Program (2017 – 2021)				
R/W 13-31 Schedule 2	$6,599,710	$5,939,739	$0	$659,971
T/W B Design	$234,586	$211,127	$0	$23,459
T/W B Construction	$2,697,743	$2,427,968	$0	$269,775
Route H Design	$265,747	$239,172	$0	$26,575
Runway 2-20 AGIS Survey & Tech-Ops	$125,000	$112,500	$0	$12,500
Runway 2-20 & T/W A Design	$501,830	$451,647	$0	$50,183
Acquire Snow Removal Equipment	$738,663	$664,796	$0	$73,867
Route H Construction	$2,923,215	$2,630,894	$0	$292,321
R/W 2-20 Construction	$7,885,902	$7,097,312	$0	$788,590
T/W B2 Design & Construction	$1,065,719	$959,147	$0	$106,572
Runway 2-20: Isolated Repairs	$3,652,372	$3,287,134	$0	$365,238
ARFF Facility	$3,000,000	$2,700,000	$0	$300,000
Long Range Needs Assessment (2022 – 2035)				
Snow Removal Equipment	$313,541	$282,187	$0	$31,354
Construct Taxiway A5	$1,177,852	$1,060,066	$0	$117,786
Master Plan Update	$315,000	$283,500	$0	$31,500
Rehab South Apron Area 1	$3,066,078	$2,759,470	$0	$306,608
Rehab South Apron Area 2	$1,322,460	$1,190,214	$0	$132,246
ARFF Facility Expansion	$875,000	$787,500	$0	$87,500
TOTAL	**$36,730,418**	**$33,084,373**	**$0**	**$3,588,545**

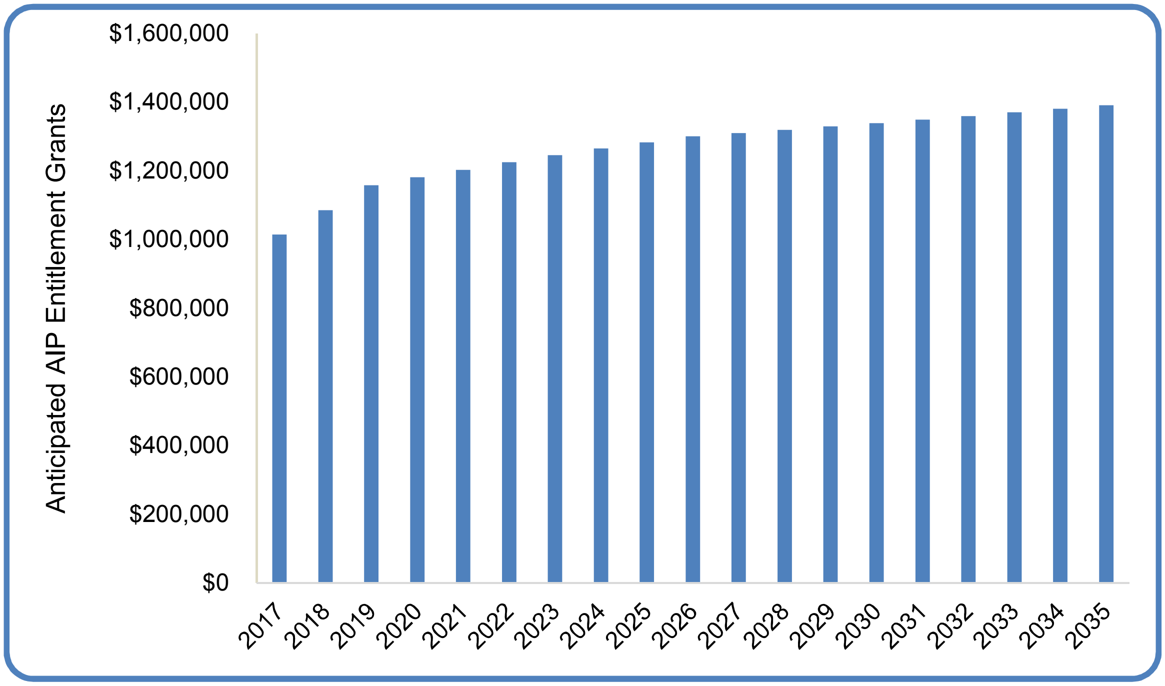
Note: The ACIP includes projects submitted to the FAA in the Airport's required ACIP, as well as an ARFF facility and expansion.
Source: City of Columbia. Compiled by WSP | Parsons Brinckerhoff, 2016.

In the past, AIP grants (both entitlement and discretionary) have played a central role in the funding of the COU's capital expenditures. This is expected to continue in the future. Historically, most airport projects have been eligible for 90 percent AIP participation, with noise projects eligible at 80 percent Federal participation. The projects in the TAMP CIP are eligible for 90 percent Federal participation. However, recent reauthorization legislation of the AIP limits the maximum amount that can be contributed to terminal projects at $20 million. Therefore, the eligibility for projects in the TAMP varies, but the level of AIP participation for Phase 1 is estimated at approximately $20 million, as shown in Table 7.2.

It is assumed that any AIP grant funding for the TAMP CIP will be discretionary grants, with entitlement grants being used to fund a portion of the other CIP projects at the Airport. Because the level of AIP discretionary funding for the TAMP CIP is anticipated to be greater than $10 million, a benefit-cost analysis will need to be developed to receive this type of funding. The development of the benefit-cost analysis can occur concurrently with any environmental approvals that will be needed for the TAMP projects.

In addition, approximately $29.6 million in AIP grants are required to fund the ACIP during the projection period. The anticipated entitlement collections during the projection period are shown in **Exhibit 7.4**. This analysis assumes that AIP discretionary grants are used to fund the Federal share of eligible projects of assumed beyond the availability of AIP entitlement grants.

Exhibit 7.4 Projected AIP Entitlement Grants



Source: WSP | Parsons Brinckerhoff, 2016

7.3.2 State Grants

The Missouri Department of Transportation (MoDOT) administers a CIP grant program to assist eligible sponsors in the planning, purchase, construction or improvement of public use airports. Funding comes from the State of Missouri's aviation trust fund through a portion of the sales tax on jet fuel sold within Missouri and a 9 cent per gallon tax on aviation gasoline. State CIP funds are issued on a cost sharing grant basis of 90 percent State and 10 percent local. The program is open to all publicly-owned airports as well as those privately-owned airports that are designated by the FAA as a reliever airport. As shown in Table 7.2, it is assumed that $2.0 million of the TAMP CIP is funded with MoDOT funds, specifically for the design of the project. These funds are a portion of a recent $2.5 million grant award by MoDOT for the TAMP. It is the City's intention to apply for additional MoDOT funds as the TAMP is implemented; however, to be conservative, no additional MoDOT funds were assumed in the analysis.

In addition to a state grant program, MoDOT also offers loans to public entities for non-highway travel programs through the Statewide Transportation Assistance Revolving (STAR) Fund. The STAR fund was authorized by the Missouri General Assembly in 1997, and can assist in the planning, acquisition, development and construction of facilities for projects. To qualify, the local district engineer must endorse projects in cooperation with MoDOT's Multimodal Team, which evaluates STAR applications and provides a recommendation to the Missouri Highways and Transportation Commission (MHTC) for approval. The STAR Fund may be considered as a financing vehicle for eligible portions of the TAMP CIP.

7.3.3 Other Funds

Other funds can include private investment or collected fees that are dedicated to a particular project or a type of project. In the case of the TAMP CIP, it is assumed that the City will begin to collect a customer facility charge (CFC) to fund the rental car parking facilities. These fees are regulated by the State of Missouri and require a legal agreement between the rental car operators and the City. These funds are typically collected on per transaction or a per transaction-day basis and can be accumulated to fund both operating and capital costs related to agreed-upon facilities. In addition, the amount of the fee collected is tied to the operations and debt requirements of the facilities they are intended to support. For example, Springfield-Branson National Airport has a CFC to fund the operations and debt requirements of its rental car quick-turn around (QTA) facility located on airport. The fees are adjusted on a period basis to match the operation and capital needs of the QTA facility. It is assumed that approximately $409,000 in CFCs will be used to fund the capital portions of the TAMP CIP related to rental car facilities.

7.3.4 Local Funds

The balance of project costs, after the consideration of other funding sources, must be funded using local funds. Historically, these funds have been comprised of PFCs and Airport resources. The remainder of this section discusses these funding sources and the assumptions used in applying these funds to the TAMP CIP funding plan.

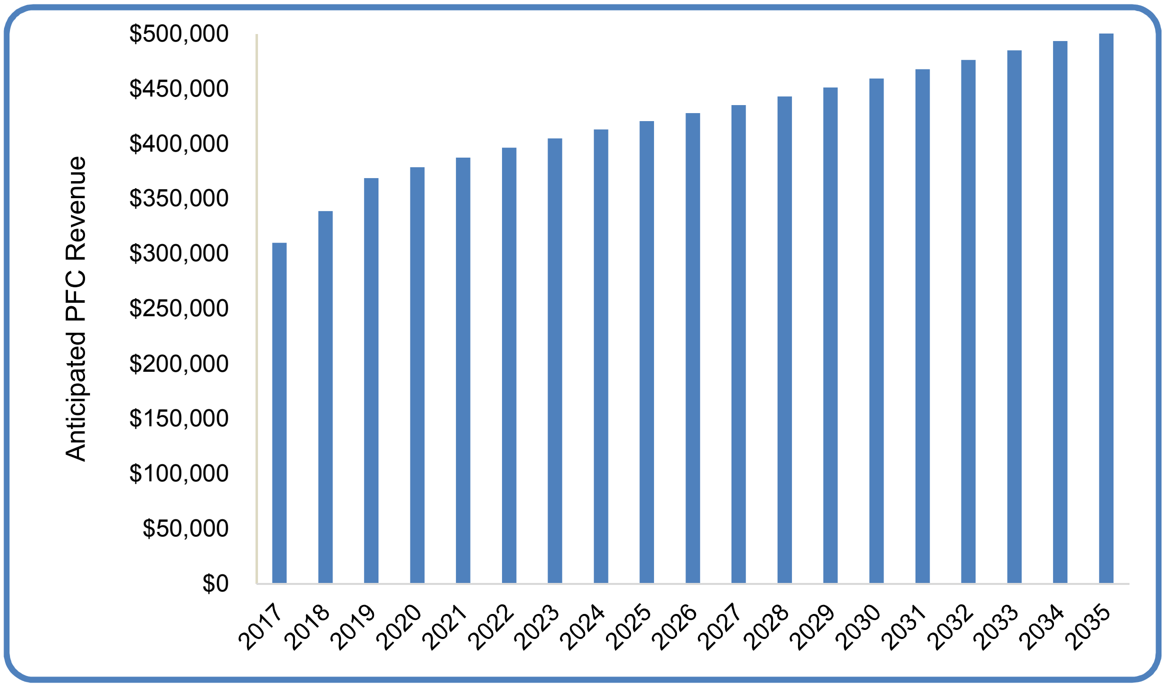
- Passenger Facility Charges - In 1990, the U.S. Congress passed the Aviation System Capacity Act (Act). This Act permitted public agencies controlling commercial service airports to apply to the FAA for approval to collect a PFC at levels of $1.00, $2.00, or $3.00 per enplaned passenger. In 2000, the Act was amended under Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21). Public agencies are currently permitted to apply to impose a PFC at the previously approved levels, as well as $4.00 or

$4.50 as a result of the enactment of AIR-21. As a trade-off for imposing a PFC, there is a reduction in the amount of AIP entitlement grants at large and medium hub airports. This reduction is 50 percent for airports imposing a $1.00, $2.00, or $3.00 PFC and 75 percent for airports imposing a $4.00 or $4.50 PFC. Since COU is a primary non-hub airport, this reduction is not applicable.

In 2002, the City initiated its PFC program at COU to impose and use a $3.00 PFC, as authorized by the FAA. Since that time, the City has submitted and received approval for several PFC applications and amendments, and has increased the amount of the PFC imposed to $4.50 per enplaned passenger. Currently, the City has the authority to collect approximately $3.6 million in PFCs, which have and are assumed to be continued for use in the future to fund the local share of FAA AIP grant-funded projects. As of September 30, 2015, the City had collected approximately $1.6 million in PFCs (including interest income) with approximately $2.0 million remaining to be collected, with an estimated charge expiration date of March 1, 2022.

Exhibit 7.5 presents the calculation of PFC revenue estimated to be received at the $4.50 level for the projection period of 2017 through 2035. With FAA approval, PFCs can be used to fund the projects contained in this analysis either concurrently or after the PFCs for currently approved projects have been collected. As long as the maximum level of PFC per passenger remains at $4.50, it is not anticipated that PFCs will be utilized to fund or finance the TAMP CIP. These funds will be used to fund the local share of FAA AIP grant-eligible projects as has been done historically. It is projected that approximately $6.2 million in PFC revenue will be collected during the projection period above and beyond existing PFC approvals.

Exhibit 7.5 Projected PFC Revenues



Source: WSP | Parsons Brinckerhoff analysis, 2016.

- Airport Funds – Funds available to the Airport Fund from City resources, such as Airport revenues, Airport Fund earnings, reserves and accumulated cash balances, as well as subsidies from the TST Fund, the PIF, and the recently passed hotel tax are assumed to fund the balance of TAMP CIP project costs after any Federal, PFCs, or other funds are applied. The local share of the TAMP CIP is approximately $26.7 million during the projection period. As previously mentioned, to the extent that the receipt of these funds is not available at the time of project expenditures, financing mechanisms as described in the financing section of this chapter would be utilized to provide the cash funding for the TAMP CIP and other ACIP projects.

7.3.5 Financing Plan

The financing plan for the TAMP CIP and the ACIP contained in this analysis assumes bonds are issued to fund 50 percent of the local share of TAMP capital expenditures, with the remaining balance being funded with subsidies from the TST Fund and the PIF. There are several types of bond financing vehicles that are available to the City to fund capital costs at COU. These include the following:

- General Obligation (GO) Bonds: GO Bonds are backed by the creditworthiness and taxing power of the municipality operating the airport. They usually bear low interest rates because of their high degree of security. However, state laws may limit a municipality's overall debt, and competition from other community financing requirements may preclude their use for an airport project. Some states have an exemption from the debt limitation rule for general obligation bonds because they are used for a revenue producing enterprise.

- Revenue Bonds: Revenue bonds pledge the revenues of an airport sponsor to the repayment of debt service. These are the most common sources of funding at larger commercial service airports. Revenue bonds are popular because they do not burden the taxpayer or affect the bonding capacity of the municipality. However, their use is limited to airports with a sufficient operating surplus to cover the debt service. Projected Net Revenues must exceed debt service requirements by at least 1.25 times and up to 2.0 times, depending on the strength of the bond issuer and the underlying assumptions with respect to the market risk for the bonds. Interest rates are dependent on the anticipated coverage ratio, but in any case will be higher than for general obligation bonds. Other factors that may affect the interest rates on revenue bonds are the strength of the local passenger market and the financial condition of the airlines serving the market.

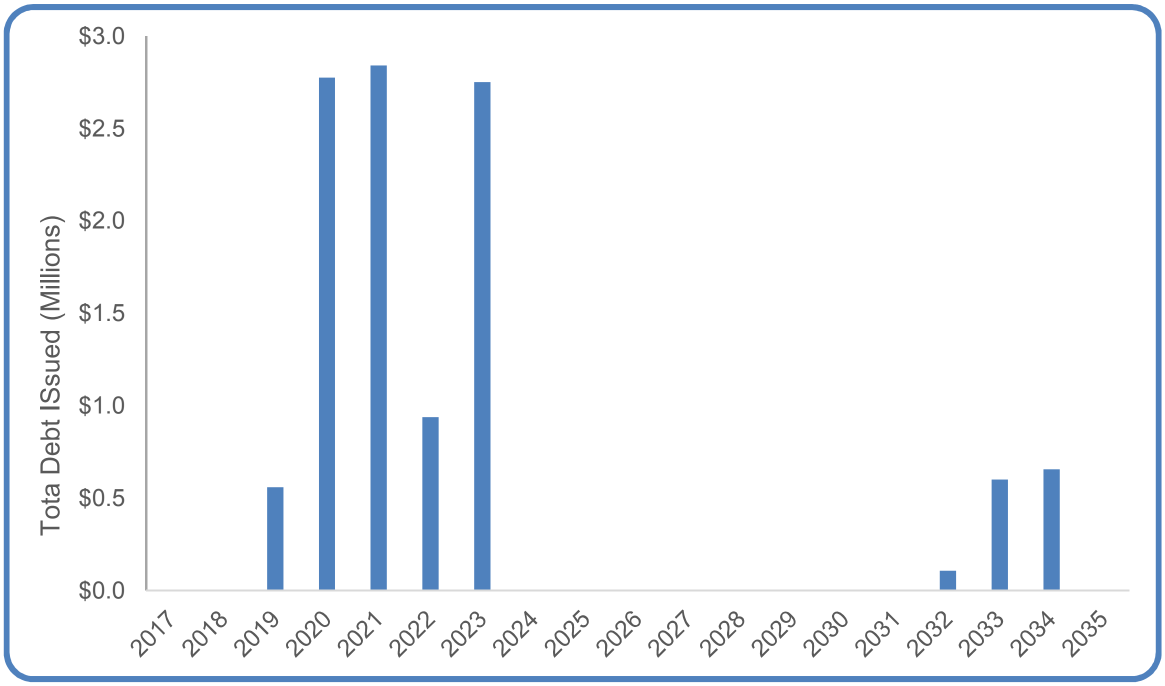
- Special Facility Revenue Bonds: Special Facility Revenue Bonds are normally issued by the airport sponsor for the construction of a facility for a third party and backed by the revenues generated from that facility. This method of funding can be used for such facilities as maintenance hangars, airline reservation centers, terminal buildings, and air cargo terminals.

- Industrial Development Bonds (IDB): IDBs can be issued by states, local government, or an airport authority to fund the construction of an airport industrial park or other facilities that may attract business and increase non-aeronautical leasing revenues at the airport.

This analysis does not assume a specific type of bond will be issued to fund portions of the cost of the TAMP CIP. Further financial analysis will be required based on the type and timing of the funding requirements, as well as City policies related to bond funding Airport capital improvements.

It is assumed the terms of the bonds issued to fund a portion of the costs of the TAMP are similar to currently outstanding City bond issuances. This includes a 30-year term, interest rates of approximately 3.5 percent, and approximately 2 percent issuance costs to cover capitalized interest and the cost of issuance. These bonds are projected to be issued in several years over the course Phase 1 of the TAMP (2018 through 2022) the local portion of the TAMP CIP and ACIP. The amount of bond proceeds required for each year of the analysis are presented in **Exhibit 7.6**.

Exhibit 7.6 Projected TAMP Costs Funded with Bond Proceeds

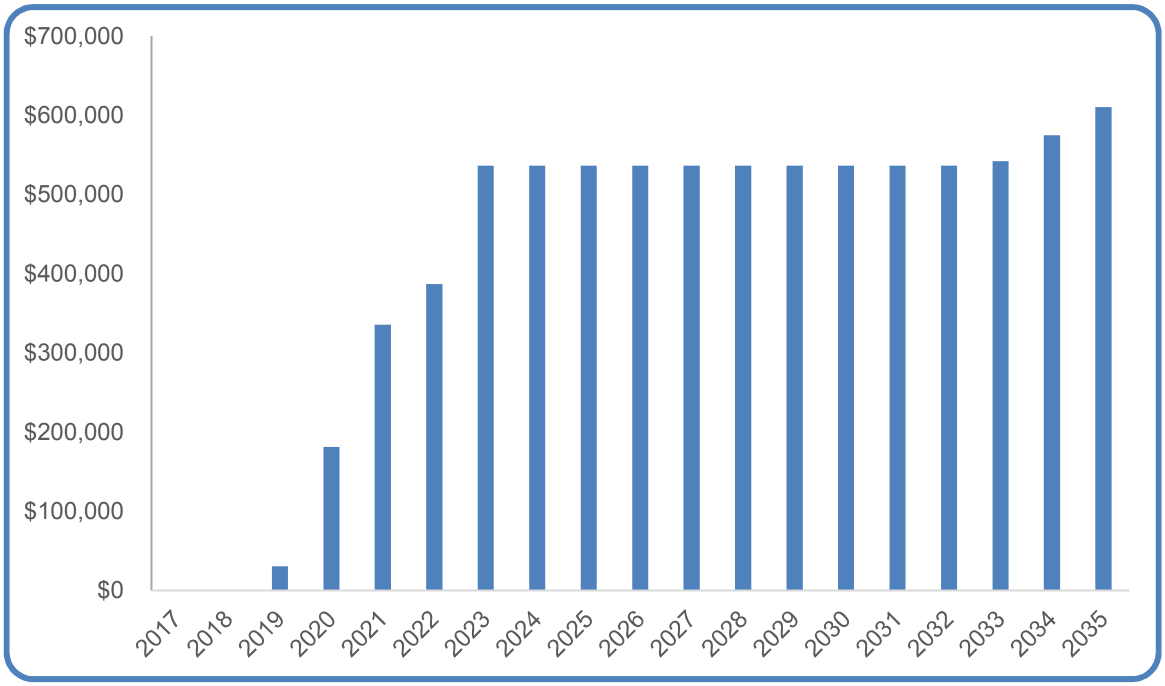


Source: WSP | Parsons Brinckerhoff analysis 2017.

7.4 Debt Service

The financing plan for the TAMP CIP and ACIP requires the issuance of bonds, as described above. The associated debt service with these bond issuances is presented in **Exhibit 7.7** and estimated to be approximately range from $30,000 in 2019 to $611,000 in 2035.

Exhibit 7.7 Projected Bond Debt Service



Source: WSP | Parsons Brinckerhoff analysis, 2016.

7.5 Operating Expenses

Estimates of future operating expenses are based upon a review of historical trends, the anticipated effect of inflation, activity fluctuations and the estimated impacts of facility improvements and expansions. COU operating expenses are assigned to functional areas of the Airport listed below:

- Administration
- Airfield Areas
- Terminal Areas
- Public Safety
- Snow Removal

Table 7.4 presents estimated operating expenses for COU projected for 2017 through 2035. Total operating expenses are projected to be approximately $2.6 million in 2017, increasing to approximately $4.2 million in 2035, which reflects an average annual growth rate of approximately 2.8 percent.

The assumptions used to prepare the operating expense projections presented in Table 7.4 are discussed in the following bullets.

- Operating expenses in 2016, which is the base year of the analysis, were developed using the 2015 expenses inflated and then verified with a comparison to six months of financial information for 2016.
- Based on a review of historical growth trends, operating expenses are expected to increase annually with inflation, with the exception of administration costs. Administration costs are expected to increase at a lower rate as the amount of personnel costs allocated to the Airport from City administration staff is expected to decrease.
- Terminal operations expenses are also projected to increase incrementally at the same rate as the increase in square footage. The TAMP CIP includes increases in terminal space in 2022 and 2034.

Table 7.4 Operating Expense Projections

	Projected 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021	Projected 2022	Projected 2023	Projected 2024	Projected 2025	Projected 2026
Terminal Areas	$205,211	$210,341	$215,600	$220,990	$226,515	$599,778	$614,772	$630,142	$645,895	662,042
Administration	1,130,705	1,142,012	1,153,432	1,164,967	1,176,616	1,188,382	1,200,266	1,212,269	1,224,392	1,236,636
Airfield Areas	472,109	483,912	496,009	508,410	521,120	534,148	547,502	561,189	575,219	589,599
Public Safety	679,537	696,526	713,939	731,787	750,082	768,834	788,055	807,756	827,950	848,649
Snow Removal	82,554	84,617	86,733	88,901	91,124	93,402	95,737	98,130	100,583	103,098
TOTAL OPERATING EXP	$2,570,116	$2,617,408	$2,665,713	$2,715,054	$2,765,456	$3,184,544	$3,246,331	$3,309,486	$3,374,039	$3,440,024

	Projected 2027	Projected 2028	Projected 2029	Projected 2030	Projected 2031	Projected 2032	Projected 2033	Projected 2034	Projected 2035
Terminal Areas	$678,594	$695,558	$712,947	$730,771	$749,040	$767,766	$786,960	$919,148	$942,126
Administration	1,249,002	1,261,492	1,274,107	1,286,848	1,299,716	1,312,714	1,325,841	1,339,099	1,352,490
Airfield Areas	604,339	619,448	634,934	650,807	667,077	683,754	700,848	718,369	736,329
Public Safety	869,865	891,612	913,902	936,749	960,168	984,172	1,008,777	1,033,996	1,059,846
Snow Removal	105,675	108,317	111,025	113,801	116,646	119,562	122,551	125,615	128,755
TOTAL OPERATING EXP	$3,507,475	$3,576,427	$3,646,915	$3,718,976	$3,792,648	$3,867,969	$3,944,977	$4,136,227	$4,219,546

Source: WSP | Parsons Brinckerhoff analysis, 2016.

7.6 Operating Revenues

Estimates of future COU revenues are based upon a review of historical trends, the anticipated effect of inflation, projected future activity levels, and the estimated impacts of the facility improvements and expansions. COU has a diverse revenue base that includes both nonairline (rental cars, terminal concessions, and other rentals) and airline (landing fees and other fees) sources. **Table 7.5** presents operating revenues for 2017 through 2035. Operating revenues are projected to be approximately $507,000 in 2017 and increase to $2.7 million in 2035, which reflects an average annual growth rate of approximately 9.7 percent.

The assumptions used to prepare the operating revenue projections presented in Table 7.5 are discussed below.

- Operating revenues in 2016, which is the base year of the analysis, were developed using the 2015 expenses inflated and increased for enplanements (where applicable) and then verified with a comparison to six months of financial information for 2016.

- Nonairline revenues are anticipated to increase with inflation. An inflation rate of 2.5% was used, which is consistent with the 30-year average annual inflation for the state of Missouri and the Midwest, in general.

- Terminal concession revenues and rental car revenue are projected to increase with projected enplanement growth and inflation. In addition, once the new terminal is opened, it is assumed that terminal concessions revenues will be commensurate with the $3.20 (2015 constant dollars) as outlined in a recent report by AirProjects Inc. conducted as part of the TAMP.

- Parking revenues, which are currently not a revenue source at COU, are expected to be initiated in 2022 and gradually increase to a level that commensurate with other airports when the new terminal facility opens in 2022. A benchmarking exercise conducted for all non-hub airports in the nation, as well as specific non-hub airport facilities in the FAA's Central Region, and certain airport facilities in Missouri to determine an appropriate level of parking revenue per enplanement. **Table 7.6** below shows the average parking and ground transportation revenue per enplanement for similar airports.

Table 7.5 Operating Revenue Projections

	Projected 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021	Projected 2022	Projected 2023	Projected 2024	Projected 2025	Projected 2026
Commissions	$182,857	$223,992	$271,906	$293,748	$315,190	$601,878	$628,559	$655,669	$683,164	$711,462
Rentals	171,263	175,545	179,933	184,432	189,042	193,769	198,613	203,578	208,668	213,884
Law Enforcement	25,425	26,061	26,712	27,380	28,065	28,766	29,485	30,222	30,978	31,752
Landing Fee	126,914	158,562	194,126	221,440	249,222	278,184	291,307	304,509	317,782	331,346
Parking Revenues	0	0	0	0	0	362,250	389,436	417,180	445,421	474,750
TOTAL OPERATING REVENUES	$506,458	$584,160	$672,677	$727,000	$781,518	$1,464,847	$1,537,400	$1,611,158	$1,686,013	$1,763,195
	Projected 2027	**Projected 2028**	**Projected 2029**	**Projected 2030**	**Projected 2031**	**Projected 2032**	**Projected 2033**	**Projected 2034**	**Projected 2035**	
Commissions	$741,313	$772,949	$806,373	$841,916	$878,957	$917,723	$958,607	$1,001,422	$1,046,366	
Rentals	219,231	224,712	230,330	236,088	241,990	248,040	254,241	260,597	267,112	
Law Enforcement	32,546	33,360	34,194	35,049	35,925	36,823	37,744	38,687	39,655	
Landing Fee	345,569	360,548	376,262	392,847	409,997	427,804	446,431	465,778	485,917	
Parking Revenues	506,247	540,264	576,834	616,464	658,279	702,634	750,131	800,527	854,145	
TOTAL OPERATING REVENUES	$1,844,907	$1,931,833	$2,023,992	$2,122,364	$2,225,149	$2,333,025	$2,447,153	$2,567,012	$2,693,194	

Source: WSP | Parsons Brinckerhoff analysis, 2017.

Table 7.6 Parking and Ground Transportation Revenue Benchmarking Data

Airport	Parking Revenue per Enplanement
Columbia Regional	$0.00
Friedman Memorial	$0.29
Flagstaff Pulliam	$0.04
Pago Pago International	$2.57
Barnstable Municipal	$4.80
Yakima Air Terminal	$3.46
Pangborn Memorial	$4.35
Salisbury-Ocean City	$7.96
Arcata	$4.48
Pitt Greenville	$8.59
Dubuque Regional	$6.30
Springfield-Branson National	$8.15

This analysis indicated that parking revenues collected at non-hub airports averaged $5.41 per enplanement at all non-hub facilities and $3.94 per enplanement for the specific airports identified for comparison, respectively in 2015. Prior to the new terminal facility being opened, it is assumed parking revenues reflect full utilization of existing parking facilities, since they are currently at full capacity most of the time. Once the new terminal facility is opened parking revenues are based on a revenue factor that is based on the benchmarking analysis since there will be additional parking facilities available. The average parking revenue per enplanement for COU from 2022 to 2035 is $3.68.

- To be conservative, no additional revenues are assumed for the re-use of the existing terminal facility once the new terminal complex in the TAMP CIP is opened in 2022.

- Airline revenues are expected to increase with the opening of the TAMP terminal complex. Currently airline revenues are $1.27 per enplanement compared to the average for non-hub airports in the nation and the selected comparable airports of approximately $8.00 and $11.00 in 2015, respectively. During the course of the analysis, the average cost per enplanement ranges from approximately $1.50 to $3.00 in constant 2015 dollars.

Table 7.7 Airline Revenue Benchmarking Data

Airport	Airline Revenue per Enplanement
Columbia Regional	$1.27
Lake Charles Regional	$3.62
Friedman Memorial	$1.37
Flagstaff Pulliam	$2.27
Manhattan Regional	$0.82
Pago Pago International	$25.54
Barnstable Municipal	$4.30
Central Nebraska Regional	$1.29
Yakima Air Terminal	$3.23
Pangborn Memorial	$1.46
Salisbury-Ocean City	$0.94
Arcata	$3.39
Pitt Greenville	$4.84
Dubuque Regional	$4.33
Lambert-St. Louis International	$15.09
Kansas City International	$8.83
Springfield-Branson National	$5.41
Joplin Municipal	$2.41

Source: FAA Certification Activity Tracking System (CATS) Data,
Compiled by WSP | Parsons Brinckerhoff, 2016

7.7 Cash Flow

Table 7.8 presents the Airport Fund's cash flow for the projection period by combining the revenue, operating expense, locally funded capital expenditures, debt service, grant receipts, and PFC projections developed in the previous sections. It is assumed that subsidies from the PIF and the TST Fund continue to subsidize airport operations and capital projects during the projection period, after the use of AIP entitlement and discretionary grants.

As shown in the table, the cash flow for each year presented, is positive, indicating the TAMP CIP and ongoing capital program do not negatively impact the financial situation of the COU, given the assumptions contained in this analysis.

Table 7.8 Cash Flow

	Projected 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021	Projected 2022	Projected 2023	Projected 2024	Projected 2025	Projected 2026
Airport Fund Beginning Balance	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Revenues	$506,458	$584,160	$672,677	$727,000	$781,518	$1,464,847	$1,537,400	$1,611,158	$1,686,013	$1,763,195
Operating Expenses	(2,570,116)	(2,617,408)	(2,665,713)	(2,715,054)	(2,765,456)	(3,184,544)	(3,246,331)	(3,309,486)	(3,374,039)	(3,440,024)
Debt Service (cumulative)	0	0	(30,350)	(181,319)	(335,869)	(386,879)	(536,478)	(536,478)	(536,478)	(536,478)
Net Operating Revenue	*($2,063,657)*	*($2,033,248)*	*($2,023,386)*	*($2,169,374)*	*($2,319,807)*	*($2,106,576)*	*($2,245,409)*	*($2,234,805)*	*($2,224,504)*	*($2,213,306)*
ACIP Expenditures (Local)	($710,005)	($698,646)	($788,590)	($471,810)	($449,140)	$0	$0	($338,108)	($132,246)	($199,360)
TAMP CIP Expenditures (Local)	0	(1,094,064)	(5,442,207)	(5,571,268)	(1,838,850)	(5,392,778)	0	0	0	0
CIP + TAMP (Local)	($710,005)	($1,792,710)	($6,230,797)	($6,043,078)	($2,287,990)	($5,392,778)	$0	($338,108)	($132,246)	($199,360)
Total Bond Issuance	$0	$547,032	$2,721,103	$2,785,634	$919,425	$2,696,389	$0	$0	$0	$0
ACIP Expenditures (Federal)	($6,390,038)	($6,287,805)	($7,097,312)	($4,246,281)	($4,042,253)	$0	$0	($3,042,970)	($1,190,214)	($1,794,240)
TAMP CIP Expenditures (Federal)	0	(745,440)	(4,710,929)	(4,303,923)	(6,306,384)	(3,884,723)	0	0	0	0
CIP + TAMP (Federal)	($6,390,038)	($7,033,245)	($11,808,241)	($8,550,204)	($10,348,637)	($3,884,723)	$0	($3,042,970)	($1,190,214)	($1,794,240)
TAMP CIP Expenditures (Other)	$0	$0	$0	$0	$0	($464,755)	$0	$0	$0	$0
AIP Beginning Balance	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,245,234*	*$0*	*$92,772*
AIP Grants (Entitlements)	$1,014,229	$1,084,522	$1,157,291	$1,181,190	$1,202,510	$1,224,371	$1,245,234	$1,264,765	$1,282,986	$1,300,317
AIP Discretionary for Terminal	$680,423	$4,915,845	$5,333,442	$5,112,289	$3,804,157	$0	$0	$0	$0	$0
AIP Discretionary for CIP	$4,695,386	$1,032,878	$5,317,507	$2,256,725	$5,341,969	$2,660,352	$0	$532,972	$0	$401,151
AIP Ending Balance	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,245,234*	*$0*	*$92,772*	*$0*
Available PFCs	$0	$0	$0	$0	$0	$297,309	$404,988	$413,016	$420,506	$427,761
CFCs	$0	$0	$0	$0	$0	$464,755	$0	$0	$0	$0
Hotel Tax Revenues	$0	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$0	$0	$0	$0
Net Capital Expenditures	*($710,005)*	*$754,322*	*($1,509,693)*	*($1,257,444)*	*$631,435*	*($399,080)*	*$404,988*	*$74,908*	*$288,260*	*$228,401*
Airport Fund Deposit/Withdrawal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Transportation Sales Tax Fund Subsidy	$1,923,459	$2,129,130	$3,533,079	$3,426,818	$1,688,372	$2,505,656	$1,840,421	$2,159,897	$1,936,244	$1,984,906
Airport Fund Ending Balance	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Table 7.8 Cash Flow (continued)

	Projected 2027	Projected 2028	Projected 2029	Projected 2030	Projected 2031	Projected 2032	Projected 2033	Projected 2034	Projected 2035
Airport Fund Beginning Balance	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Revenues	$1,844,907	$1,931,833	$2,023,992	$2,122,364	$2,225,149	$2,333,025	$2,447,153	$2,567,012	$2,693,194
Operating Expenses	(3,507,475)	(3,576,427)	(3,646,915)	(3,718,976)	(3,792,648)	(3,867,969)	(3,944,977)	(4,136,227)	(4,219,546)
Debt Service (cumulative)	(536,478)	(536,478)	(536,478)	(536,478)	(536,478)	(536,478)	(542,247)	(574,898)	(610,564)
Net Operating Revenue	*($2,199,046)*	*($2,181,072)*	*($2,159,400)*	*($2,133,091)*	*($2,103,977)*	*($2,071,422)*	*($2,040,071)*	*($2,144,113)*	*($2,136,916)*
ACIP Expenditures (Local)	($199,360)	($199,360)	($199,360)	($199,360)	($199,360)	($199,360)	($286,860)	($199,360)	($199,360)
TAMP CIP Expenditures (Local)	0	0	0	0	0	(207,972)	(1,177,011)	(1,285,718)	0
CIP + TAMP (Local)	($199,360)	($199,360)	($199,360)	($199,360)	($199,360)	($407,332)	($1,463,871)	($1,485,078)	($199,360)
Total Bond Issuance	$0	$0	$0	$0	$0	$103,986	$588,506	$642,859	$0
ACIP Expenditures (Federal)	($1,794,240)	($1,794,240)	($1,794,240)	($1,794,240)	($1,794,240)	($1,794,240)	($2,581,740)	($1,794,240)	($1,794,240)
TAMP CIP Expenditures (Federal)	0	0	0	0	0	(386,234)	(2,381,668)	(3,034,188)	0
CIP + TAMP (Federal)	($1,794,240)	($1,794,240)	($1,794,240)	($1,794,240)	($1,794,240)	($2,180,474)	($4,963,408)	($4,828,428)	($1,794,240)
TAMP CIP Expenditures (Other)	$0	$0	$0	$0	$0	$0	($83,096)	($86,048)	$0
AIP Beginning Balance	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
AIP Grants (Entitlements)	$1,309,417	$1,318,892	$1,328,662	$1,338,875	$1,349,046	$1,359,280	$1,369,758	$1,380,309	$1,390,990
AIP Discretionary for Terminal	$0	$0	$0	$0	$0	$0	$0	$0	$0
AIP Discretionary for CIP	$484,823	$475,348	$465,578	$455,365	$445,194	$821,194	$3,593,650	$3,448,119	$403,250
AIP Ending Balance	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Available PFCs	$435,242	$443,031	$451,064	$459,460	$467,822	$476,235	$484,849	$493,523	$502,304
CFCs	$0	$0	$0	$0	$0	$0	$83,096	$86,048	$0
Hotel Tax Revenues	0	0	0	0	0	0	0	0	0
Net Capital Expenditures	*$235,882*	*$243,671*	*$251,704*	*$260,100*	*$268,462*	*$172,889*	*($390,516)*	*($348,696)*	*$302,944*
Airport Fund Deposit/Withdrawal	$0	$0	$0	$0	$0	$0	$0	$0	$0
Transportation Sales Tax Fund Subsidy	$1,963,164	$1,937,401	$1,907,697	$1,872,991	$1,835,515	$1,898,533	$2,430,587	$2,492,809	$1,833,972
Airport Fund Ending Balance	$0	$0	$0	$0	$0	$0	$0	$0	$0

Source: WSP | Parsons Brinckerhoff analysis, 2017.

7.8 Scenario Analysis

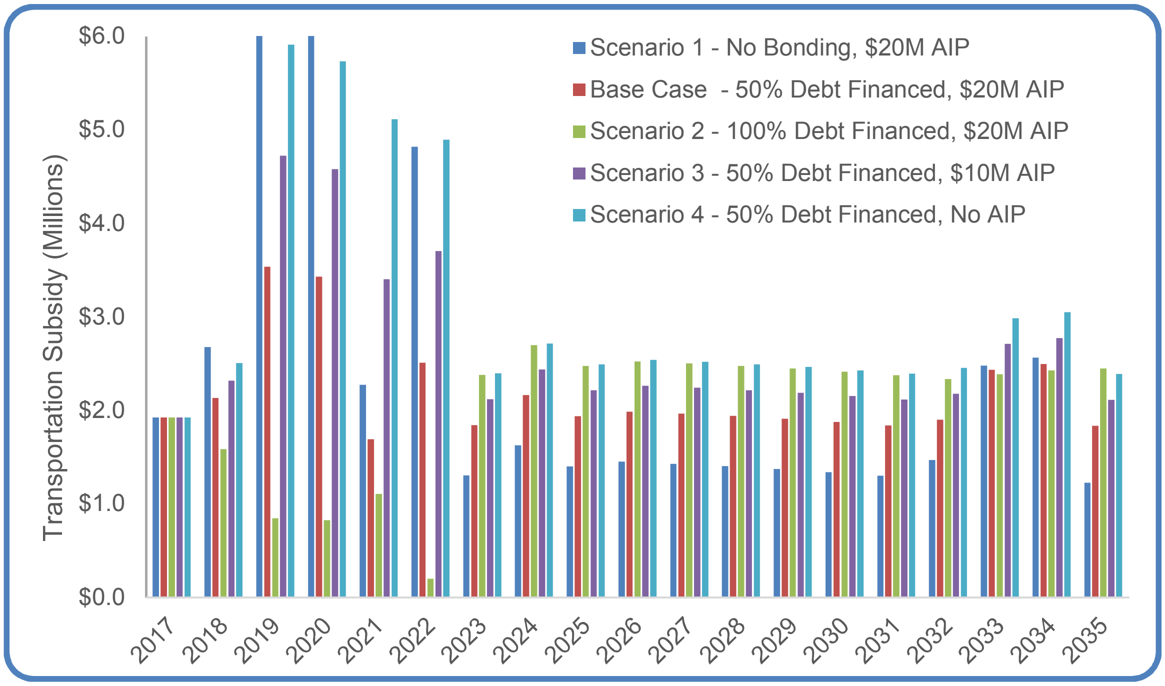
Several scenarios were prepared to show how much the transportation subsidy is impacted depending on the percentage of the TAMP CIP costs that are bond funded, as well as the amount of FAA AIP Grant Funding that is received for Phase 1 of the TAMP. A summary of the scenarios prepared is presented in **Table 7.9** below.

Table 7.9 Scenario Details

	Scenario 1	Base Case	Scenario 2	Scenario 3	Scenario 4
TAMP Bond Funding	0% Debt	50% Debt	100% Debt	50% Debt	50% Debt
FAA AIP Grants	$20M	$20M	$20M	$10M	$0M

For Scenario 1, the transportation subsidy ranged between $2.3 million and $6.2 million during Phase 1 of the TAMP CIP. In the Base Case, the required transportation subsidy declines significantly during Phase 1 compared to Scenario 1 ranging between $1.6 million (2022) and $3.5 million (2019), although the subsidies in outer years (Phase 2) increase to about $2 million because of increased debt service. In Scenario 3, the required transportation subsidy in Phase 1 of the TAMP CIP is the lowest and ranges between $800,000 and $1.6 million, but increases to approximately $2.4 million during Phase 2. For Scenario 4 and Scenario 5, the transportation subsidy increases compared to the Base Case, as there are additional TAMP CIP costs to fund with local funds, and additional debt service for the debt funded portion of capital costs. **Exhibit 7.8** below graphically presents a comparison of total transportation subsidy required for each of the scenarios compared to the Base Case.

Exhibit 7.8 Transportation Subsidy Comparison by Scenario



Source: WSP | Parsons Brinckerhoff analysis, 2017.

Table 7.10 shows the transportation subsidy, as well as the debt service for the different scenarios developed compared to the Base Case. The total debt service for Scenario 2 is about $15 million for the analysis period through 2035, and about $8 million for the Base Case. For the scenarios where the amount of FAA AIP funding is decreased compared to the Base Case, total debt service is approximately $10.3 million for Scenario 3 and approximately $13.6 million for Scenario 4.

Table 7.10 Scenario Comparison Summary

Transportation Subsidy					
Year	Scenario 1: No Debt, $20M	Base Case: 50% Debt, $20M	Scenario 2: 100% Debt, $20M	Scenario 3: 50% Debt, $10M	Scenario 4: 50% Debt, $0M
2017 - 2021	$19,126,513	$12,700,857	$6,275,200	$16,938,924	$21,176,991
2022 - 2026	$10,590,722	$10,427,124	$10,263,525	$12,728,075	$15,029,027
2027 - 2031	$6,834,379	$9,516,767	$12,199,155	$10,900,420	$12,284,073
2032 - 2035	$7,727,065	$8,655,901	$9,584,737	$9,762,824	$10,869,746
Total	$44,278,679	$41,300,648	$38,322,618	$50,330,243	$59,359,838

Debt Service					
Year	Scenario 1: No Debt, $20M	Base Case: 50% Debt, $20M	Scenario 2: 100% Debt, $20M	Scenario 3: 50% Debt, $10M	Scenario 4: 50% Debt, $0M
2017 - 2021	-	$547,538	$1,095,076	$768,936	$990,334
2022 - 2026	-	$2,532,790	$5,065,580	$3,862,561	$5,192,333
2027 - 2031	-	$2,682,388	$5,364,777	$4,066,042	$5,449,695
2032 - 2035	-	$2,264,187	$4,528,373	$3,371,109	$4,478,032
Total	-	$8,026,903	$16,053,806	$12,068,648	$16,110,393

Source: WSP | Parsons Brinckerhoff analysis, 2017.

7.9 Findings/Next Steps

Based on the analysis presented throughout the preceding sections, this section summarizes the principal findings and next steps with respect to the implementation of the TAMP CIP and ACIP presented in this chapter. Based upon the assumptions and limitations underlying these financial feasibility analyses, the following findings are presented:

- The TAMP CIP and ACIP projects are projected to be financially feasible with adequate cash flow and/or funding sources to meet all operating requirements of COU.

- At the same time, the estimates of required airline fees following implementation of the TAMP CIP and ACIP remain reasonable and competitive.

  The TAMP CIP and ACIP may be implemented with reliance on Federal FAA AIP discretionary grants. Should the projected level of discretionary funding not be received, consideration will be given to adjusting the assumptions related to the City subsidy requirements and bond funding requirements contained in the analysis.

- After the approval of the TAMP Study, the City will need to obtain necessary environmental approvals required to implement the TAMP. Concurrently, the City will need to begin the process of applying for an FAA discretionary grant, which requires the completion of a benefit-cost analysis for any grant request over $10 million.

8 AIRPORT LAYOUT PLAN DRAWING SET

The major improvements outlined in the preferred alternative are incorporated into the revision of the Airport Layout Plan (ALP) drawing set, see **Appendix J**. The ALP is a group of drawings that serve as the primary tool for the guidance of future growth at the Airport. The various drawings depict the recommendations contained within the 2009 Airport Master Plan and revisions to the terminal area based on the recommendations of this Terminal Area Master Plan (TAMP).

The ALP requires FAA approval independent of the Terminal Area Master Plan's approved forecast and design aircraft (FAA approval date October 27, 2015). Review of the ALP drawing set is accomplished through several intermediate steps, including reviews by the Airport and City of Columbia, Missouri Department of Transportation, the FAA Airports District Office (ADO), and other FAA offices involved in the associated airspace review. The current official ALP for Columbia Regional Airport was produced as part of the 2009 Master Plan by RS&H, is dated July 2011, and was approved by the FAA in July 2013.

The preliminary ALP set included in this chapter is a revision of the current ALP incorporating the terminal area changes due to the recommendations of the Terminal Area Master Plan, and has been approved by the City of Columbia. The ALP has been reduced from its working size of 22-inch x 34-inch to 11-inch x 17-inch to be incorporated here for easy reference. The ALP is presented here in its preliminary version approved by the City of Columbia pending final review, approval, and signature by the FAA and MoDOT Aviation Section. The ALP drawings presented in this chapter are subject to revision until formally accepted by the agencies, and may vary from the final ALP drawing set on file with the FAA and MoDOT Aviation Section.

The ALP drawing set for Columbia Regional Airport consists of 20 sheets and specifically includes the following:

- Title Sheet (revised)
- Data Sheet
- Existing Conditions
- Airport Layout Plan (Future) (revised to add new terminal and associated projects)
- Aerial Photo
- GA Terminal Area Plan (revised)
- Future Terminal Area Plan (new)
- Runway 2 Inner Approach Drawing (Existing/Future) (revised)
- Runway 2 Departure Surface Drawing (Existing/Future)
- Runway 20 Inner Approach Drawing (Existing/Future) (revised)
- Runway 20 Departure Surface Drawing (Existing/Future)
- Runway 13 Inner Approach Drawing (Existing/Future) (revised)
- Runway 13 Departure Surface Drawing (Existing/Future)
- Runway 31 Inner Approach Drawing (Existing/Future) (revised)
- Runway 31 Departure Surface Drawing (Existing/Future)
- Runway 2-20 and 13-31 Centerline Profile Drawing
- Part 77 Airport Airspace Drawing (2 sheets)
- Airport Land Use Map (revised)

- Airport Property Map (revised)

The following sections provide brief descriptions of the elements of the ALP drawing set, as revised.

8.1 Title Sheet

The Title Sheet lists the contents of the drawing set and identifies the airport owner and parties responsible for preparing the plans. Graphic representations of the airport location (state county map and sectional aeronautical chart) and the airport vicinity (aerial map) are also presented on the title sheet for orientation purposes.

8.2 Data Sheet

There are no revisions to the Data Sheet.

8.3 Existing Conditions

Modifications were made to the existing parking at the current terminal location to reflect recent expansions. The existing property line was updated for recent acquisitions.

The airport is currently constructing the shift of Runway 13-31 as depicted on the previous approved ALP. A separate ALP update shall be performed at the time of close-out of the current construction project (anticipated after the end of this year).

8.4 Airport Layout Plan (Future)

The ALP depicts existing facilities and future improvements recommended in the 2009 Master Plan Update and this Terminal Area Master Plan. The drawing reflects improvements recommended in both documents through the 20-year planning horizon for Columbia Regional Airport. Major components include:

- Depiction of Airport infrastructure and major facilities;
- Compliance with geometric design separation and clearance standards;
- Airspace features and Navigational (NAVAID) facilities;
- Boundary limits of Airport property interests and land uses; and
- General notes.

This drawing was revised. The proposed new passenger terminal facility on the north side of the airfield was added.

Notable additional revisions include:

- Depiction of Taxiway Echo (adjacent to the Future Terminal Area) as a 50-foot wide taxiway able to serve Aircraft Design Group (ADG) III aircraft and a fillet layout at the Runway 13 approach end of the cross-wind runway for a Taxiway Design Group (TDG) 4. This proposed taxiway is shown at 400-foot separation from Runway 13-31 centerline to accommodate potential long range improved approach minimums using NextGen LPV/WAAS with approach lighting or ADG-III aircraft like MD80/90, B737 or A320s;
- Existing Taxiway Bravo is parallel to Runway 13-31 and will be changed to Charlie once Runway 13-31 construction is completed. The attached ALP depicts this taxiway as Charlie;
- Existing Taxiway Bravo (future Charlie) is currently 35 feet wide and separated from Runway 13-31 by 355 feet, which exceeds FAA standards (300’ for ADG-II). Per the airport’s construction consultant, the runway separation will not change as part of the runway reconstruction project and is not part of the Terminal Area Plan Update;
- Future Taxiway Charlie’s width is recommended to be increased to 50 feet (for ADG III) in the future as well as the fillet layout at the Runway 13 approach end of the cross-wind runway for a TDG 4; (see Section 8.6 for more details); and,
- Conversion of the existing terminal building as a future General Aviation (GA) facility.

8.5 Airport Photo

There are no revisions to the Aerial Photo Sheet.

8.6 Terminal Area Plans

Scaled drawings (GA Terminal Area and a new Future Terminal Area Plans) depicting close-in terminal area features for the airside and landside layout. The drawings show required separation requirements and design standards, and include general notes, data sources, and a legend noting key drawing symbols. Key facilities shown on the drawing include:

- Apron Configuration and Aircraft Parking Positions;
- Aircraft Taxiways and Taxilanes;
- Airport Terminal Building;
- Terminal Roadway Circulation and Auto Parking;
- Aircraft Hangars and Airport Buildings;
- Fueling Facilities;
- Airport Storage Facilities;
- Commercial/Tenant Operating Areas; and
- Reserved Terminal Area Space for Long-Term Development.

The major addition to this new sheet is the proposed new passenger terminal facility on the north side of the airfield and the existing terminal facility being available for repurposing, such as for general aviation purposes. The taxiway serving the future passenger terminal area is based ADG-III and TDG-4. This up-gauge in taxiway width is based on the Safety Risk Management Panel, conducted May 2, 2017 and documented in the associated report (see appendix). The panel agreed that air carrier aircraft crossing the runway end (Runway 13 threshold) to access the future terminal apron would minimize the risk of runway incursions. Thus, Taxiway C, between Taxiway A and the Runway 13 threshold would be widened to FAA design standards TDG 3&4, which is 50 feet in width and the fillet designs would follow TDG 4. For conservative planning purposes, TDG 4 was chosen to accommodate potential use by MD-80/90 aircraft, which matches the assumption for Taxiway E separation. It should be noted that it may be several years before airlines begin using larger equipment at COU.

Currently, the airlines serving COU are using ADG II (CRJ-900) aircraft which can be served by a 35-foot wide taxiway. For this reason, the upgrades to Taxiway C are shown as a future proposed project.

8.7 Existing/ Future Runway Approach Drawings

Minor change to this drawing (changed legend “Description” to “Pavement” to reflect use of blue “future” hatching for both landside and airside pavements). The existing property line was updated for recent acquisitions.

8.8 Existing/Future Runway Departure Drawings

Minor change to this drawing (changed legend “Description” to “Pavement” to reflect use of blue “future” hatching for both landside and airside pavements. The existing property line was updated for recent acquisitions.

8.9 Runway 2-20 and Runway 13-31 Centerline Profile

No changes to this drawing.

8.10 Part 77 Airspace Surfaces

No changes to this drawing.

8.11 Airport Land Use Plan

A scaled drawing depicting existing and planned land uses, both on and off the Airport. The drawing provides recommended land uses for aviation and non-aeronautical land uses within the Airport vicinity, as designated by local planning and ordinances. The following are major items depicted on the drawing:

- Airfield Operating Areas;
- Terminal Area;

- Ground Access System;
- Other Aeronautical and Non-Aeronautical Uses; and
- Surrounding Land Use Areas/Designations;
- 65 DNL (Integrated Noise Model).

The major addition to this sheet is the proposed new passenger terminal facility on the north side of the airfield. This area is separated into two uses: air carrier operations area and terminal/landside development.

8.12 Airport Property Map

A scaled drawing depicting airport property interests as consistent with the Airport Layout Drawing. This drawing documents past Airport land acquisition, including fee-simple and easement tracts, and summarizes how theses tracts have been acquired or released (i.e. federal funds, surplus property, local funds, etc.). A drawing table lists an inventory of all Airport property parcels by number; including the grantor, grantee, type of interest, acreage, grant project number, purpose, and book, page and date of recording.

The major addition to this sheet is the proposed new passenger terminal facility on the north side of the airfield.